MASS. EA 12.2: C37/v.1

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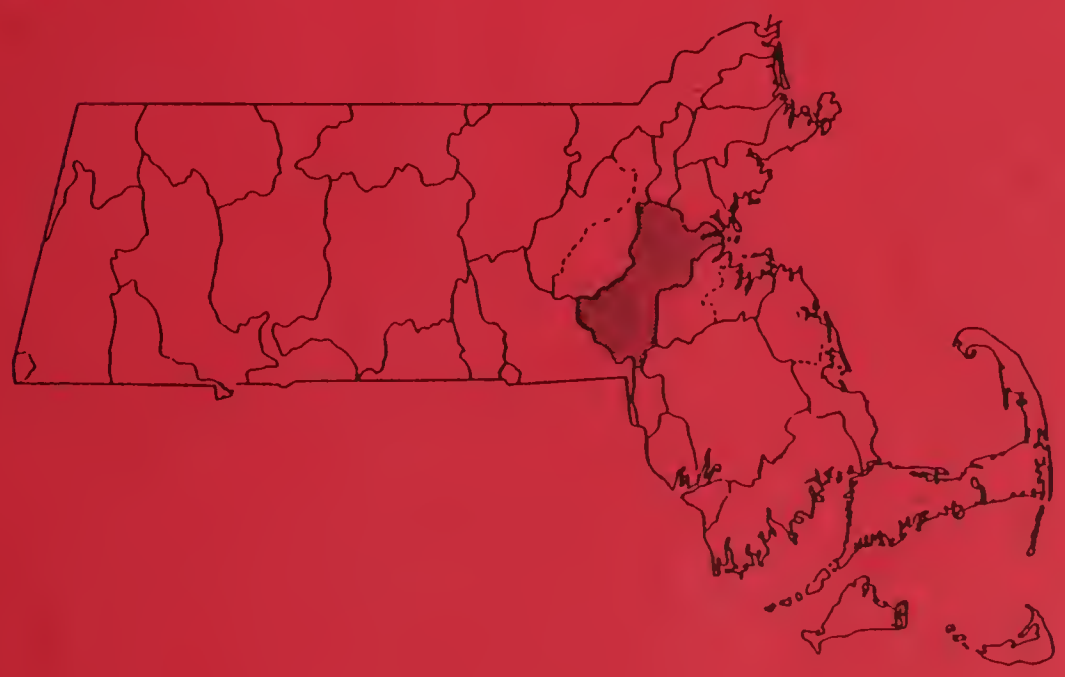
MASSACHUSETTS • WATER RESOURCES COMMISSION

Volume I

Charles River Basin

Inventory and Analysis of Current and Projected Water Use



prepared by
Massachusetts Department of Environmental Management
Division of Water Resources
July 1988

for the
Massachusetts Water Resources Commission
Michael S. Dukakis, Governor James S. Hoyte, Secretary James Gutensohn, Commissioner

CHARLES RIVER BASIN, VOLUME I
Inventory and Analysis of Current and Projected Water Use

Executive Office of Environmental Affairs
Water Resources Commission

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July 1988

PUBLICATION: #15542-150-500-6-30-88-C.R.
Approved By: Ric Murphy, State Purchasing Agent

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EXECUTIVE SUMMARY

This report is the first step in developing a comprehensive basin plan for the Charles River basin and is intended to provide a basis for making sound decisions about water resources management. The Division of Water Resources has compiled data on existing water supply sources, water demand and use for communities with public water supplies in the Charles River basin, and has projected water use through the year 2020. The following are summary points from the report.

- The 1985 water demand in the Charles basin was approximately 193 million gallons per day (mgd). The average day water demand is projected to increase by 29 percent to 248 mgd by 2020, and the basin population is projected to increase by 7 percent during the 1985 - 2020 period.

- In total, 162 mgd entered the Charles basin as water supply from sources located in other basins. Thirty-one mgd came from sources in the Charles basin. Since 181 mgd was discharged from the basin as wastewater, there was a net outflow from the Charles basin of 19 mgd.

- The Massachusetts Water Resources Authority (MWRA) supplied 79 percent of the basin's water demand in 1985, while 16 percent of the demand was met with supplies from within the basin. The remaining 5 percent of supply was obtained from neighboring basins. The City of Boston accounted for 62 percent of total demand in 1985 and represented 50 percent of the basin's population.

- Twenty-three Charles basin communities are served totally or in part by a public water supply system. Only Sherborn does not have a public water supply system.

- Surface water sources supplied 88 percent of the water used by public water supply systems in 1985, and ground water sources supplied 12 percent.

- If the 1985 maximum daily demand for all communities occurred on the same day, the total amount of water used by the basin's public water supply systems would have been 299 mgd.

- The 1985 estimated average day demand from on-site non-residential wells was approximately 56.85 mgd, or 29 percent of the average day demand of the public water supply systems in the basin in 1985.

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PREFACE

The Massachusetts Water Resources Commission (WRC) has the primary responsibility for determining the state's water resources policy and directing the water resources planning activities for the Executive Office of Environmental Affairs. The Division of Water Resources (DWR), in the Department of Environmental Management, provides technical staff support to the Commission and is responsible through the Commission, for long-range water resources planning for the Commonwealth. The central element in the development of a statewide water resources management plan is the preparation of a management plan for each of the twenty-seven river basins of the Commonwealth. These plans are being developed pursuant to the Water Resources Planning Regulations (313 CMR 2.00) adopted by the Commission. The basin planning process includes local, regional, and state assessments of water needs and the availability of water resources. The plans also are in conformance with the Massachusetts Water Supply Policy Statement and are consistent with other water-related state and federal laws, plans, and regulations.

The river basin planning process consists of five steps, shown in Table 1. In brief, they are:

1. Development of an inventory of the basin's water supply and demand.
2. Analysis of data and identification of the future water needs in the basin.
3. Development and analysis of alternatives to meet these projected needs.
4. Preparation of a basin-specific water resources management plan for the approval of the Water Resources Commission.
5. Adoption of the plan.

This first volume represents the inventory and analysis step of the planning process. It includes the collection of existing data on the river basin's surface and ground water resources, current and projected water demand, water supply sources, and current and projected demographic profiles for communities in the basin. In the second volume (Step 2), the inventory data and short- and long-term water demand projections are used in a computer or an analytical model that simulates the operation of each town's supply system in meeting its demand.

The analysis includes DWR recommended guidelines for a minimum or low flow threshold for the river. The minimum streamflows protect a variety of river uses, including wildlife, fin and shellfish, irrigation, hydropower, agriculture, recreation, and wetlands, as well as municipal and industrial supply, and the dilution of effluent. When the analysis is completed, a basin water budget can be prepared to estimate the volume of water available under both average precipitation and drought conditions, while protecting or enhancing environmental quality. The basin water

TABLE 1

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DIVISION OF WATER RESOURCES
RIVER BASIN PLANNING PROGRAM

RIVER BASIN PLANNING FORMAT
Water Supply Element

STEP 1 DEVELOP INVENTORY OF BASIN SUPPLY AND DEMAND	STEP 2 ANALYZE BASIN INVENTORY AND IDENTIFY FUTURE WATER NEEDS	STEP 3 DEVELOP AND ANALYZE ALTERNATIVES TO MEET PROJECTED NEEDS	STEP 4 PREPARE WATER RESOURCES MANAGEMENT PLAN	STEP 5 ADOPT PLAN
(a) Demographic profile of each Community from Federal, State, Regional and Community Studies. (b) Historical and existing water demand of each community. (c) Existing and proposed water supply sources and systems via questionnaire replies. (d) Water resources management structure and organization via questionnaire replies. (e) Water requirements for recreation, fish, wildlife, agriculture, hydropower and dilution. (f) Outline by DEQE of basin water quality. (g) Unregulated historical streamflow data.	(a) 1990-2020 population changes of each community. (b) 1990-2020 projected water demand of each community. (c) Analyze existing and proposed water supply sources and systems as presented in questionnaire replies. (d) Conservation measures reported in questionnaire replies compared to the state conservation guidelines i.e. retrofit, leak detection, system rehabilitation, public education, ground water protection. (e) Task Force analysis of minimum streamflow thresholds. (f) Relationship between available water resources, projected demand and minimum streamflow thresholds. (g) Community and basin deficits.	(a) Local alternatives to meet projected community water needs (conservation, infrastructure storage, interconnections with contiguous communities). (b) Preliminary regional alternatives (MWRA, diversions, new regional reservoirs, interconnection). (c) Analysis and comparison of the relevant economic, environmental and institutional impacts of the alternatives and assessment of their ability to meet future needs. (d) Identification of deficient communities using local alternatives and not using regional alternatives per Step 3(b)	(a) Selection by WRPTF for Step 3(d) communities of the best mix of new local and regional alternatives (Step 3 a & b) to meet deficits. (b) Selection of alternative(s) for all communities and basins. (c) Preparation of draft plan. (d) Review and comment by local, regional, and state agencies and the Water Resources Commission on draft basin plan. (e) Preparation of final plan based on review comment.	(a) WRC review of final draft plan. (b) WRC vote on plan's adoption or adoption with modification.

<---------- CONTINUOUS INTERACTION WITH LOCAL, REGIONAL AND STATE AGENCIES ---------->

The adopted plan is the basis for decision making under the Interbasin Transfer Act, Water Resources Management Act and MWRA Contracts, as outlined in 313 CMR 2.00, Water Resources Management Planning Regulations.

budget will provide an estimate of the basin's ability to meet projected water demands with available resources and any planned water supply developments.

The third volume focuses on developing water supply alternatives for those communities which are projected to experience water supply shortages. The alternatives and recommendations developed in this step of the process are submitted to the WRC for review and for public comment. The alternatives and recommendations as approved by the WRC will be published as Volume IV.

I. INTRODUCTION

Purpose

The Charles River, its tributaries, lakes, ponds, and aquifers of the Charles River basin provide valuable water resources for the region. This first volume attempts to provide a greater understanding of the river basin and its characteristics in order to provide a basis for making sound decisions about water resources management for the benefit of all water users.

This report summarizes the water demand and water use data for communities in the Charles River Basin. The report includes 1980-1985 water use demand data for these communities, 1985 information on the sources of public water supply systems, 1985 state census figures, 1990-2020 population forecasts developed by the Metropolitan Area Planning Council (MAPC), and 1990-2020 projected water demands.

Methods

The water use data was obtained by DWR from the superintendents of twenty-four public water supply agencies and from the Division of Water Supply (DWS), Massachusetts Department of Environmental Quality Engineering (DEQE). However, readers of this report should keep in mind that the projections presented are for broad basin planning purposes only. Caution is recommended when using this data for more detailed analyses. The projected water demand figures are sound, provided that the basic assumptions stated in the methodology remain valid.

To obtain the most recent water use and supply information, DWR conducted personal interviews and telephone conversations with water supply superintendents. Each superintendent was sent a draft of the data specific to their community which they reviewed, updated and verified.

Population projections are based on studies by regional planning agencies, such as the Metropolitan Area Planning Council (MAPC), the Massachusetts Institute for Social and Economic Research (MISER), community planning departments, the 1980 federal census, and the 1985 state census. The 1985 population was chosen for all communities (except Boston) because it is the most recent year in which the state census had been conducted. The 1985 population for Boston was obtained from the Boston Water and Sewer Commission.

Base water demand for a community was calculated by averaging its 1980-1985 average day demand. Water demand projections for 1990-2020 were made utilizing the methodology outlined in Appendix 2. This methodology is based on assumptions concerning population growth and water use in the basin study area during the period 1985-2020.

II. CHARLES RIVER BASIN DESCRIPTION

The Charles River basin contains 311 square miles and twenty-four of the state's communities, including Boston. The basin is bounded on the north by the Concord, Shawsheen and the Mystic River basins, on the east by the Atlantic Ocean, on the south by the Taunton and Neponset basins, and on the west by the Blackstone River basin (See Figure 1).

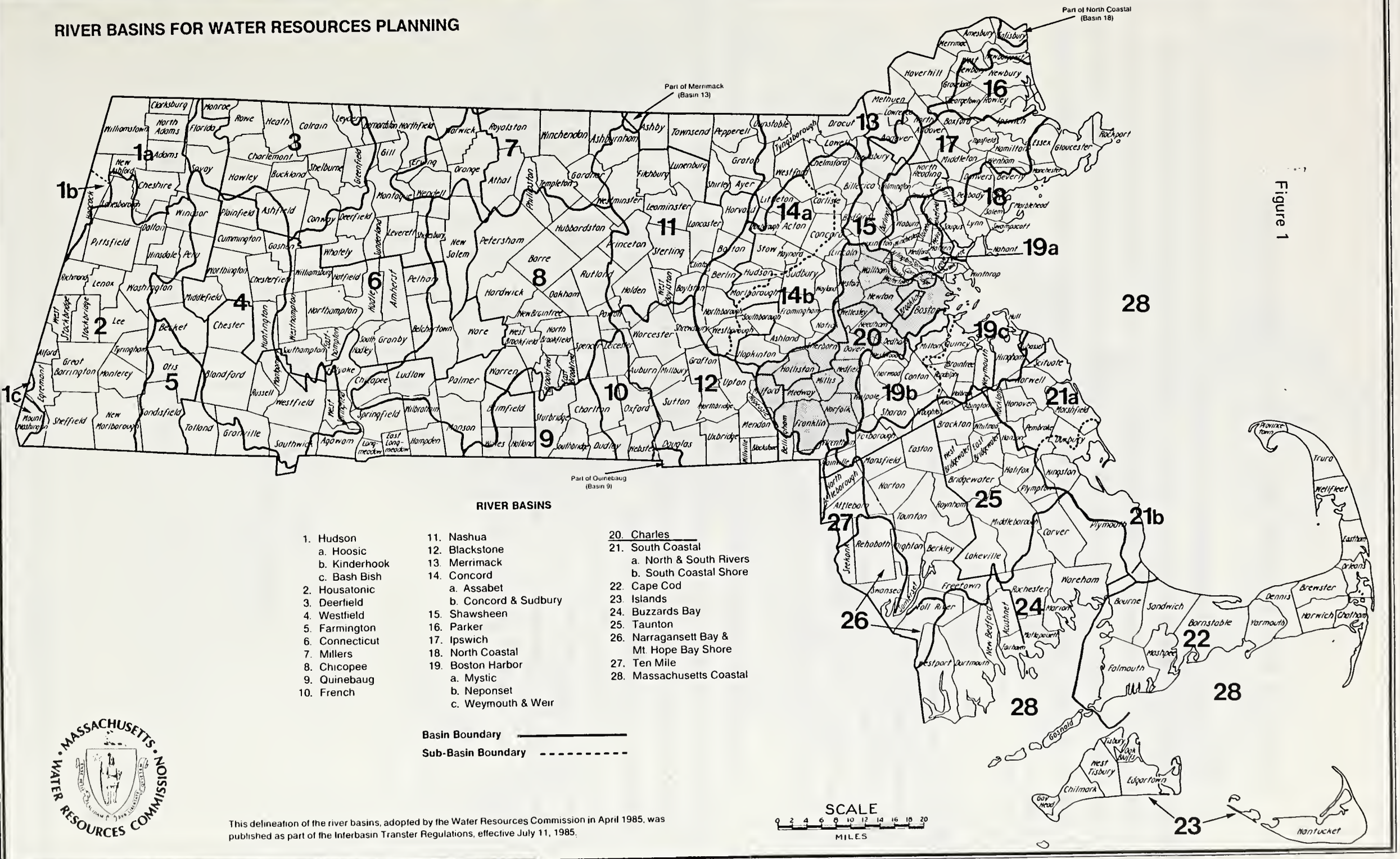
The Charles River has headwaters on the south slope of Honey Hill in Hopkinton, at an elevation of about 500 feet above mean sea level. Echo Lake, sometimes referred to as the source of the Charles, actually is one mile downstream at an elevation of 347 feet. From there, the river flows to Boston Harbor (elevation 2.4 feet mean sea level at Charles River Dam, Boston Harbor), a distance of 78.9 miles, with an average hydraulic slope of 4.5 feet per mile. Important tributaries are shown below, along with the acreage of their associated subwatersheds.

Sub-Watersheds of the Charles River Basin

Important Tributaries	Subwatershed Acreage
Hopping Brook, Mine Brook	33,160
Bogastow Brook, Chicken Brook	24,592
Mill River, Shepards Brook, Stop River	31,242
Trout Brook, Waban Brook	26,908
Pine, Rock Meadow, and Rosemary Brooks	26,432
Beaver Brook, Stony Brook	26,768
Cheese Cake Brook	35,816

Sources: U.S.D.A., S.C.S., Mass. Water Resources Study - Area Measurements, 1972. U.S. Corps of Engineers, Charles River, Mass., Main Report & Appendices, 1972. U.S.G.S., Water Resources Investigations Report 84-4281, 1972.

RIVER BASINS FOR WATER RESOURCES PLANNING



RIVER BASINS

1. Hudson
   a. Hoosic
   b. Kinderhook
   c. Bash Bish
2. Housatonic
3. Deerfield
4. Westfield
5. Farmington
6. Connecticut
7. Millers
8. Chicopee
9. Quinebaug
10. French
11. Nashua
12. Blackstone
13. Merrimack
14. Concord
    a. Assabet
    b. Concord & Sudbury
15. Shawsheen
16. Parker
17. Ipswich
18. North Coastal
19. Boston Harbor
    a. Mystic
    b. Neponset
    c. Weymouth & Weir
20. Charles
21. South Coastal
    a. North & South Rivers
    b. South Coastal Shore
22. Cape Cod
23. Islands
24. Buzzards Bay
25. Taunton
26. Narragansett Bay & Mt. Hope Bay Shore
27. Ten Mile
28. Massachusetts Coastal

Basin Boundary ———————

Sub-Basin Boundary - - - - - - - - - -

SCALE
0 2 4 6 8 10 12 14 16 18 20
MILES

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This delineation of the river basins, adopted by the Water Resources Commission in April 1985, was published as part of the Interbasin Transfer Regulations, effective July 11, 1985.

Figure 1

Executive Office of Environmental Affairs • Water Resources Commission

Prepared by the Department of Environmental Management • Division of Water Resources

III. CHARLES RIVER BASIN STUDY AREA DESCRIPTION

The Charles River study area (referred to as the Charles River basin throughout this report) includes twenty-four communities with either a majority of their land area within the Charles River basin or public water supply sources in the basin. These communities, as shown in Figure 2 and Table 2, are Bellingham, Boston, Brookline, Cambridge, Dedham, Dover, Franklin, Holliston, Lincoln, Medfield, Medway, Milford, Millis, Natick, Needham, Newton, Norfolk, Sherborn, Waltham, Watertown, Wellesley, Weston, Westwood and Wrentham.

Westwood, which has 33 percent of its land area in the Charles River basin, is included in the study area because it is part of the Dedham/ Westwood Water District which draws a portion of its water from the Charles. This water district also is included in the Volume I report of the Neponset River basin. Wrentham is included in the study because it has more land area in the Charles basin than in the other basins it overlays (Blackstone, Taunton, and Ten Mile) and has more water supply sources in the Charles and Taunton basins.

Nine other communities with less than 50 percent of their land area in the Charles River basin are not included in the study area because they have no existing public water supply sources within the basin boundaries. Those communities are Arlington, Ashland, Belmont, Foxborough, Hopkington, Lexington, Somerville, Walpole, and Wayland. The Towns of Hopedale and Mendon, with minor land area in the Charles basin, are not included in this report. Portions of these communities are served by the Milford Water Company and their demand on Charles River basin resources is reflected in the figures included in this report for the Town of Milford. No community located entirely outside of the Charles basin has water supply sources within the basin.

Figure 2

Charles River Basin
STUDY AREA COMMUNITIES

Study Area Communities

Basin Boundary

Prepared by DEM, Division of Water Resources

TABLE 2

COMMUNITIES WITH LAND AREA IN THE CHARLES RIVER BASIN

COMMUNITY	PERCENT OF LAND AREA IN CHARLES BASIN	WATER SUPPLY AGENCIES WITH SOURCES IN CHARLES BASIN	COMMUNITIES WITH SOURCES IN CHARLES BASIN	SIGNIFICANT SELF-SUPPLIED SECTOR IN CHARLES BASIN	MWRA SUPPLY	NOTES
(ARLINGTON)	9				X	
(ASHLAND)	5					
BELLINGHAM	52	X	X			
(BELMONT)	48				X	
BOSTON	67				X	
BROOKLINE	100				X	
CAMBRIDGE	65	X			PARTIAL	
DEDHAM	73	X	X			
DOVER	85	X	X	X		
(FOXBOROUGH)	-					
FRANKLIN	90	X	X			
HOLLISTON	97	X	X			
(HOPEDALE)	19					
(HOPKINTON)	11		X			
(LEXINGTON)	39				X	
LINCOLN	60	X	X			
MEDFIELD	77	X	X			
MEDWAY	100	X	X			
(MENDON)	2					
MILFORD	86	X	X			
MILLIS	100	X	X			
NATICK	53	X	X			
NEEDHAM	100	X	X		PARTIAL	
NEWTON	100				X	
NORFOLK	100	X	X			
SHERBORN	82			X		NO CENTRAL SUPPLY
(SOMERVILLE)	34				X	
(WALPOLE)	10					
WALTHAM	100		X		X	
WATERTOWN	97				X	
(WAYLAND)	5					
WELLESLEY	100	X	X		CONTRACT COMMUNITY	
WESTON	91				X	
WESTWOOD	33	X	X			
WRENTHAM	43	X	X	X		

NOTE: PARENTHESES INDICATE THAT LESS THAN 50 PERCENT OF A TOWN'S LAND AREA IS IN THE CHARLES BASIN AND THAT IT HAS NO PUBLIC WATER SUPPLY SOURCE IN THE BASIN.

IV. PUBLIC WATER SUPPLY SYSTEMS

1. 1980-1985 Demand

Public water supply system customers are the primary water users in the Charles River basin, with a 1980-85 average day demand (ADD) of 202 million gallons per day (mgd). In 1985, 1,125,799 people living in the Charles basin (98 percent), obtained their water from a public water supply system. The other 2 percent, or 21,643 individuals, obtained their water from on-site residential or institutional wells.

All Charles basin communities, except Sherborn, which does not have a public system, are served totally or in part by a public water supply system. These 23 communities are served by 29 separate water supply systems, 20 of which are city or town water departments, and nine which are independently-owned water supply utilities.

The Boston water supply system is by far the largest in the basin with a 1985 average day demand of 119.26 mgd. This amounts to 62 percent of the total 1985 water demand in the basin. The six year average day demand for Boston was 126 mgd. Boston and the neighboring communities of Brookline, Cambridge, Newton, and Waltham have a combined 1985 average day demand of 163 mgd. These communities comprise approximately 25 percent of the basin's land but used 81 percent of the total 1985 public water supply demand.

If the 1985 maximum day demand for all communities had occurred on the same day in 1985, the total amount of water used by the basin's public water supply systems would have been 299 mgd. The six year average maximum day demand was 319 mgd for the basin. Appendix 1 lists the public water supply agencies that serve the Charles basin . Tables 3 and 4 list the 1980-85 average and maximum day demands respectively for each community in the basin.

Sources of Data

Water demand figures were obtained from the 1980-1985 "Water Supply Statistics Report" submitted by each water supply agency to the regional offices of the Division of Water Supply in the Department of Environmental Quality Engineering (DEQE). The average day demands for each year were calculated by dividing the year's water consumption (in gallons) by 365 days (366, if a leap year).

TABLE 3
AVERAGE DAY DEMAND
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	1980	1981	1982	1983	1984	1985	SIX YEAR AVERAGE
BELLINGHAM	1.03	1.08	1.16	1.13	1.15	1.26	1.14
BOSTON	135.24	131.99	128.59	125.31	117.32	119.26	126.29
BROOKLINE	7.15	7.04	6.70	6.99	6.78	7.37	7.01
CAMBRIDGE	17.25	17.20	17.01	17.69	17.53	15.59	17.05
DEDHAM	2.50	2.50	2.42	2.52	2.53	2.52	2.50
DOVER	0.11	0.11	0.11	0.11	0.11	0.11	0.11
FRANKLIN	2.04	1.88	1.86	2.11	2.05	2.03	1.99
HOLLISTON	1.04	1.07	0.98	0.98	0.97	1.02	1.01
LINCOLN	0.58	0.42	0.31	0.50	0.45	0.39	0.44
MEDFIELD	0.95	0.91	0.91	1.03	1.08	1.11	1.00
MEDWAY	0.72	0.68	0.63	0.81	0.72	0.73	0.72
MILFORD	2.40	2.47	2.61	2.80	2.79	2.93	2.67
MILLIS	0.69	0.63	0.66	0.69	0.59	0.55	0.64
NATICK	4.45	4.22	3.81	3.99	4.33	4.39	4.20
NEEDHAM	3.63	3.63	3.45	3.73	3.53	3.59	3.59
NEWTON	11.11	11.61	11.15	11.60	10.49	10.10	11.01
NORFOLK	0.22	0.23	0.18	0.18	0.22	0.24	0.22
SHERBORN				NO CENTRAL SUPPLY			
WALTHAM	11.50	10.92	10.82	9.91	9.81	10.47	10.57
WATERTOWN	4.70	4.31	4.12	3.86	3.53	3.43	3.99
WELLESLEY	3.05	2.90	2.52	2.66	2.52	2.53	2.70
WESTON	1.15	1.20	1.07	0.91	1.20	1.16	1.12
WESTWOOD	1.23	1.23	1.19	1.24	1.25	1.24	1.23
WRENTHAM	0.82	0.80	0.75	0.86	0.87	0.93	0.84
TOTAL:	213.56	209.03	203.01	201.61	191.82	192.95	202.04

TABLE 4
MAXIMUM DAY DEMAND
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	1980	1981	1982	1983	1984	1985	SIX YEAR AVERAGE
BELLINGHAM	2.23	1.95	2.46	2.04	1.84	2.22	2.12
BOSTON	223.80	184.45	192.07	184.72	178.08	179.80	190.49
BROOKLINE	12.69	11.76	10.95	14.23	13.65	14.01	12.88
CAMBRIDGE	24.69	24.00	24.43	22.33	23.03	22.20	23.45
DEDHAM	3.70	3.71	3.80	3.98	3.84	3.44	3.74
DOVER	0.14	0.14	0.14	0.14	0.14	0.14	0.14
FRANKLIN	2.87	2.34	3.26	3.01	2.60	2.76	2.81
HOLLISTON	2.52	2.26	2.45	2.52	1.63	1.93	2.22
LINCOLN	1.05	0.66	0.87	1.17	0.68	0.58	0.84
MEDFIELD	1.98	2.26	2.25	2.79	2.03	2.03	2.22
MEDWAY	1.56	1.37	1.56	1.59	1.35	1.35	1.46
MILFORD	3.59	3.76	3.81	4.07	4.01	3.66	3.81
MILLIS	1.52	1.26	1.66	1.71	0.84	0.77	1.29
NATICK	7.35	6.59	7.05	11.52	8.31	6.94	7.96
NEEDHAM	8.20	7.83	8.92	9.52	7.03	6.38	7.98
NEWTON	21.00	24.99	23.50	23.54	19.77	17.37	21.70
NORFOLK	0.34	0.43	0.27	0.26	0.24	0.24	0.30
SHERBORN				NO CENTRAL SUPPLY			
WALTHAM	13.30	18.24	17.22	15.66	15.96	15.19	15.93
WATERTOWN	7.05	6.63	6.47	6.62	5.99	6.13	6.48
WELLESLEY	5.37	5.13	4.83	5.22	4.19	4.70	4.91
WESTON	3.04	2.71	2.71	2.65	2.92	2.77	2.80
WESTWOOD	1.85	1.86	1.89	1.96	1.89	1.69	1.86
WRENTHAM	1.81	1.81	2.21	1.59	1.48	2.07	1.82
TOTAL:	351.65	316.14	324.78	322.84	301.50	298.37	319.21

2. 1985 Sources of Supply

The Charles basin communities obtained more of their public water supply from sources outside the Charles basin than from sources within the basin. Of the communities' 1985 average day demand of 192.95 mgd, 16 percent, or 31.42 mgd, came from sources within the Charles basin and 84 percent, or 161.53 mgd, came from sources located outside the Charles basin. The five other river basins and the Massachusetts Water Resources Authority (MWRA) which furnish water to public water supply systems serving the Charles basin in 1985 are listed below.

Charles River Basin Sources of Public Water Supply

Basin	Volume Supplied (mgd)*	Percent of 1985 ADD
MWRA **	152.8	79%
Charles	31.4	16
Concord	4.4	2
Neponset	2.9	2
Blackstone	1.0	<1
Taunton	0.4	<1
	192.9mgd	100%

* 1985 data

** Massachusetts Water Resources Authority sources are located in the Chicopee and Nashua River basins

Table 5 lists the portion of each community's average day demand obtained from sources in the various river basins in 1985. Seven communities obtain all of their water supply from sources located in the Charles River basin. Six communities obtain all of their water from the MWRA and eleven communities obtain their water from sources in more than one basin. The MWRA provided 152.8 mgd, or 79 percent, of the total 1985 average day demand in the basin. Cambridge and Needham are partially supplied by the MWRA but obtain 97 percent and 86 percent respectively of their water from sources in the Charles River basin.

Appendix 3A explains the process used to identify and locate public water supply sources, provides a table listing public water supply sites and locations, and includes a map showing the locations of the water supply sources.

TABLE 5
1985 SOURCE OF SUPPLY BY BASIN
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	CHARLES	MWRA*	CONCORD	BLACKSTONE	TAUNTON	NEPONSET	TOTAL 1985 ADD
BELLINGHAM	0.29			0.97			1.26
BOSTON		119.26					119.26
BROOKLINE		7.37					7.37
CAMBRIDGE	15.06	0.53					15.59
DEDHAM	0.94					1.58	2.52
DOVER	0.05		0.02			0.04	0.11
FRANKLIN	2.03						2.03
HOLLISTON	1.01		0.01				1.02
LINCOLN	0.18		0.21				0.39
MEDFIELD	0.12					0.99	1.11
MEDWAY	0.73						0.73
MILFORD	2.93						2.93
MILLIS	0.55						0.55
NATICK	0.21		4.18				4.39
NEEDHAM	3.08	0.51					3.59
NEWTON		10.10					10.10
NORFOLK	0.24						0.24
SHERBORN		NO CENTRAL SUPPLY					
WALTHAM		10.47					10.47
WATERTOWN		3.43					3.43
WELLESLEY	2.53						2.53
WESTON		1.16					1.16
WESTWOOD	0.91					0.33	1.24
WRENTHAM	0.56				0.37		0.93
	31.42	152.83	4.42	0.97	0.37	2.94	192.95
TOTAL:	16%	79%	2%	<1%	<1%	2%	100%

* MWRA SOURCES ARE LOCATED IN THE CHICOPEE AND NASHUA BASINS

Appendix 5 contains two summary sheets for each of the basin communities that have a public water supply system. A source map is also included for those communities which are not fully-supplied by the MWRA.

The Massachusetts Water Resources Authority

The Massachusetts Water Resources Authority (MWRA) delivers and distributes water to 46 communities, primarily in the Boston metropolitan area. The MWRA, which was established in 1984 by the Legislature, receives water from the Metropolitan District Commission's (MDC) Quabbin and Wachusett Reservoirs. The Legislature created the MWRA in order to modernize the metropolitan area water and sewer systems and to clean up Boston Harbor.

The Quabbin Reservoir, formed in a valley of the impounded Swift River in the Chicopee River basin, has a capacity of 412 billion gallons. It collects runoff from 186 square miles of watershed and a limited quantity of runoff from 98 square miles of the Ware River watershed. The Wachusett Reservoir, created by a large dam across the South Branch of the Nashua River, has a capacity of 65 billion gallons and a drainage area spreading over 108 square miles. The reservoirs provide a combined safe yield of approximately 300 million gallons per day (mgd) to the MWRA system. Since 1969, the water withdrawn from the reservoir system has exceeded the 300 mgd level every year.

In the Charles River basin, there are six communities which are fully-supplied by the MWRA, two communities which are partially-supplied by the MWRA, and two communities (Dedham and Wellesley) that have rights to MWRA water but did not utilize these rights in the 1980-1985 period. Figure 3 displays the entire MWRA water supply system and Figure 4 shows the Charles basin communities with rights to MWRA water.

Sources of Data

Each Municipal Water Resources Management Plan - Phase II questionnaire (1982) includes a map showing the location of the water supply system's source(s). This information was updated during personal interviews with water superintendents in 1984 and verified in 1987 when the superintendents reviewed and verified town summary sheets and maps. The 1985 DEQE, Division of Water Supply Statistics Sheets, Section 2, provided pumpage data for each water supply source.

For example, the Town of Bellingham has 7 active sources supplying water to their service area, 3 sources located in the Charles basin, and 4 sources in the Blackstone basin. The actual pumpage in each basin was obtained from the DEQE Statistics Sheets, Section 2, by combining the totals for each well in each basin; thus, of the total 1.26 mgd demand for Bellingham in 1985, 0.29 mgd or 23 percent came from sources in the Charles and 0.97 mgd, or 77 percent, came from sources in the Blackstone basin.

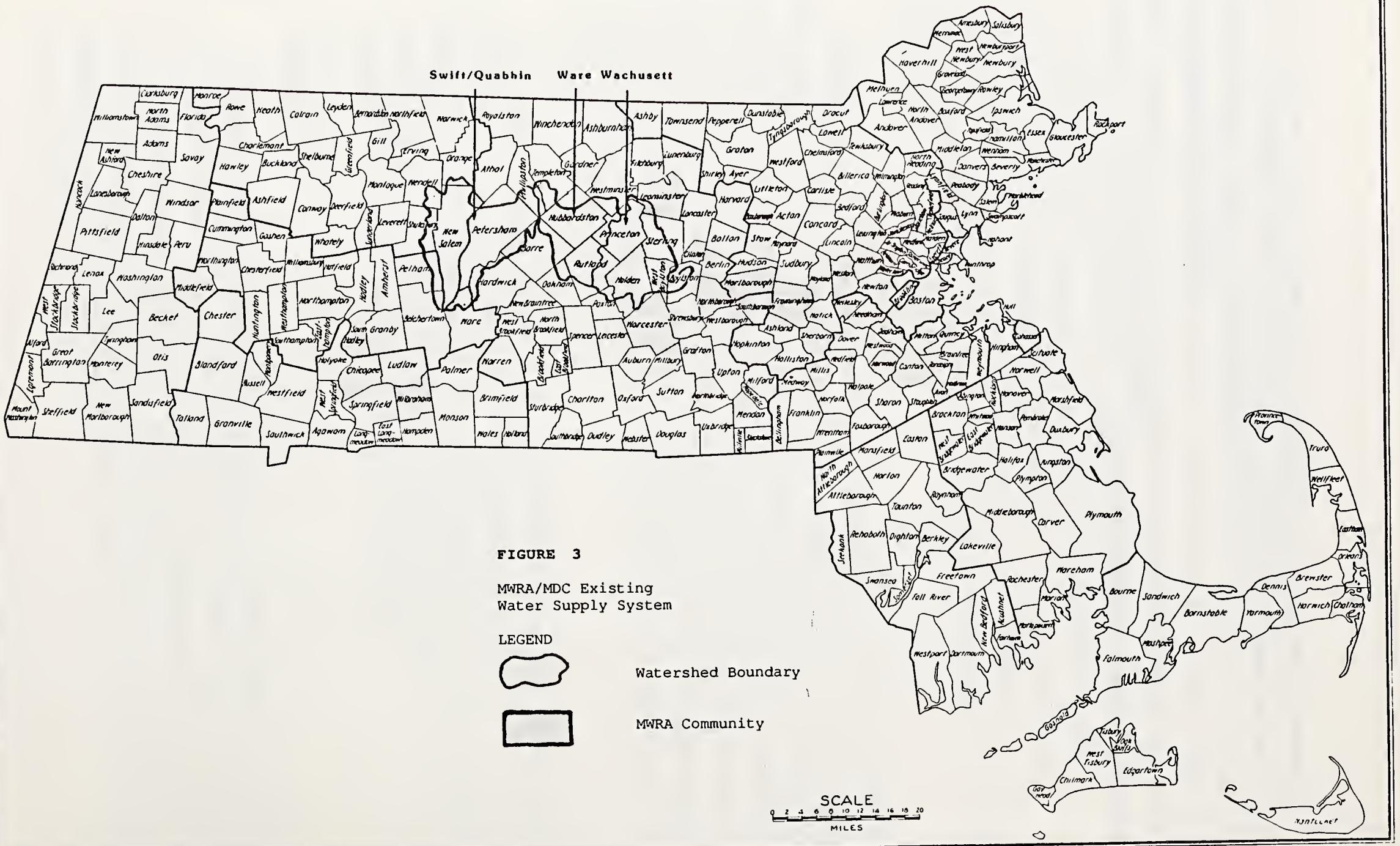

Swift/Quabbin
Ware Wachusett
Clarksburg
Monroe
Rowe
Heath
Colrain
Leyden
Bernardston
Northfield
Warwick
Royalston
Winchendon
Ashburnham
Ashby
Townsend
Pepperell
Dunstable
Tyngsborough
Dracut
Lowell
Methuen
Lawrence
North Andover
Andover
Boxford
Ipswich
Rockport
Gloucester
Essex
Hamilton
Wenham
Beverly
Danvers
Peabody
Salem
Marblehead
Swampscott
Lynn
Nahant
Revere
Winthrop
Boston
Chelsea
Everett
Somerville
Cambridge
Watertown
Newton
Brookline
Dedham
Needham
Wellesley
Weston
Waltham
Belmont
Arlington
Lexington
Bedford
Burlington
Woburn
Stoneham
Melrose
Wakefield
Reading
North Reading
Wilmington
Billerica
Tewksbury
Chelmsford
Westford
Groton
Littleton
Carlisle
Bedford
Concord
Lincoln
Acton
Boxborough
Harvard
Lancaster
Leominster
Fitchburg
Lunenburg
Shirley
Ayer

Figure 4

Charles River Basin
1985 MWRA WATER USERS

- Fully-supplied communities
- Partially-supplied communities
- Entitled to MWRA water supply
- Study area boundary
- Basin boundary

Prepared by DEM, Division of Water Resources

3. 1985 Type of Supply

Surface water from the MWRA is the major source of supply for the large urban systems of the basin, while ground water is the main source for suburban and rural communities in the basin.

Surface water sources supplied 169.79 mgd, or 88 percent, of the water used by public water supply systems in 1985. Eleven communities obtained all or part of their water supply from surface water sources in 1985. Seven communities received 100 percent of their public water supply from surface sources in 1985. All of these seven communities are fully supplied by the MWRA. Cambridge obtained 97 percent of its water from surface water sources located in the Charles basin making it the largest user of Charles basin surface water.

The MWRA provided a total of 152.83 mgd to basin communities or 90 percent of their total surface water supply. The remaining 10 percent of the surface water used came from sources in the Charles basin and supplied the communities of Cambridge, Lincoln, Medway, and Milford. Total surface water use is as follows:

Total Surface Water Use - Charles River Basin (1985)

	ADD (mgd)	Percent of Surface Supply
MWRA fully supplied	151.79	
(Boston, Brookline, Newton, Waltham, Watertown, Weston)		
Partially supplied	1.04	
(Cambridge*, Needham*)	152.83	90%
Charles Basin		
(Cambridge*, Lincoln, Medway, Milford)	16.96	10%
	169.79 mgd	100%

* Cambridge and Needham are partially supplied by the MWRA and can draw water as needed according to their contracts. In 1985 Cambridge and Needham used MWRA water and their own water sources.

The communities of Lincoln, Medway, Milford, and Needham obtained their water supply from both surface and ground water sources in 1985. Ground water sources supplied 23.16 mgd, or 12 percent, of the water used by these public water supply systems in 1985.

23.16 mgd, or 12 percent, of the water used by these public water supply systems in 1985. Sixteen communities received all or part of their supply from ground water sources in 1985. Twelve communities received 100 percent of their supply from ground water sources and one community, Medway, received 99 percent. The Town of Sherborn has no public supply system and obtains all of its water from private on-site ground water sources.

Table 6 lists the amounts and percentages of the 1985 average day demand from surface and ground water sources in the basin communities. The figures represent each community's total 1985 water use from sources located in the Charles and other basins.

Sources of Data

The quantity of surface and ground water used for each water supply system was determined from the DEQE, Division of Water Supply, 1985 Water Supply Statistics Sheets, Section 2, and/or interviews with water supply officials. In Dover, with more than one water supply system, this information was aggregated to arrive at a community total.

TABLE 6
1985 TYPE OF WATER SUPPLY
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD) AND PERCENT

COMMUNITY	AVERAGE DAY DEMAND	SURFACE WATER USE PERCENT	SURFACE WATER USE MGD	GROUND WATER USE PERCENT	GROUND WATER USE MGD
BELLINGHAM	1.26	0%	0.00	100%	1.26
BOSTON	119.26	100	119.26	0	0.00
BROOKLINE	7.37	100	7.37	0	0.00
CAMBRIDGE	15.59	100	15.59	0	0.00
DEDHAM	2.52	0	0.00	100	2.52
DOVER	0.11	0	0.00	100	0.11
FRANKLIN	2.03	0	0.00	100	2.03
HOLLISTON	1.02	0	0.00	100	1.02
LINCOLN	0.39	18	0.07	82	0.32
MEDFIELD	1.11	0	0.00	100	1.11
MEDWAY	0.73	1	0.01	99	0.72
MILFORD	2.93	62	1.82	38	1.11
MILLIS	0.55	0	0.00	100	0.55
NATICK	4.39	0	0.00	100	4.39
NEEDHAM	3.59	14	0.51	86	3.08
NEWTON	10.10	100	10.10	0	0.00
NORFOLK	0.24	0	0.00	100	0.24
SHERBORN			NO CENTRAL SUPPLY		
WALTHAM	10.47	100	10.47	0	0.00
WATERTOWN	3.43	100	3.43	0	0.00
WELLESLEY	2.53	0	0.00	100	2.53
WESTON	1.16	100	1.16	0	0.00
WESTWOOD	1.24	0	0.00	100	1.24
WRENTHAM	0.93	0	0.00	100	0.93
TOTAL:	192.95	88%	169.79	12%	23.16

4. 1985 Estimated Distribution of Water Use

The estimate of the distribution of water use by the communities and water supply superintendents is shown in Table 7. In 1985, the water provided by the public water supply systems in the Charles basin was utilized in the following manner:

Residential	44 %
Unaccounted - for	25
Commercial	19
Industrial	7
Other	5
Agricultural	<1
Total	100%

The main water use in the Charles basin is residential, which accounts for approximately 44 percent of the 1985 total volume furnished by public water supply systems. In six communities, residential water use was 75 percent or more and in 16 communities, residential use was 60 percent or more of total water use.

In 1985, unaccounted-for water represented approximately 25 percent of the basin's water supply demand. This is the most difficult category of water use to define since its meaning is open to interpretation. As a result, different methods were used by local water supply agencies to calculate water use in this category. For example, many small systems include leakage and flushing of mains in residential consumption and then listed zero in the unaccounted-for water category. Other systems have high percentages of unaccounted-for water because they have a high percentage of unmetered use assigned to the unaccounted-for category. If Boston is not included in the water use analysis, the total unaccounted-for water percentage for the basin falls from 25 to 18 percent.

TABLE 7
1985 ESTIMATED DISTRIBUTION OF WATER USE
CHARLES RIVER BASIN
(PERCENT)

COMMUNITY	RESIDENTIAL	COMMERCIAL	INDUSTRIAL	AGRICULTURAL	OTHER	UNACCOUNTED	NOTES
BELLINGHAM	65%	7%	0%	0%	0%	28%	
BOSTON	34	20	7	0	8	31	1986 FIGURES
BROOKLINE	69	5	0	0	0	26	
CAMBRIDGE	37	32	11	0	0	20	
DEDHAM	53	21	6	0	0	20	
DOVER							DOVER ALSO HAS 6 SMALL
WATER DEPT	57	23	0	0	0	20	SYSTEMS WHICH ARE
WATER COMP	100	0	0	0	0	0	100% RESIDENTIAL
FRANKLIN	65	1	15	0	0	19	
HOLLISTON	85	6	4	0	0	5	
LINCOLN	95	0	0	0	0	5	
MEDFIELD	84	3	3	0	0	10	
MEDWAY	73	6	1	1	-	19	
MILFORD	47	9	11	0	6	27	
MILLIS	65	1	20	0	0	14	
NATICK	61	10	10	2	0	17	
NEEDHAM	60	9	21	-	0	10	UNACCT. INCLUDES METERED PUBLIC INSTITUTIONAL/COMMERCIAL COMBINED
NEWTON	75	15	4	0	0	6	
NORFOLK	77	5	0	0	0	19	8% OF UNACCT. IS NOT METERED
SHERBORN			NO CENTRAL SUPPLY				
WALTHAM	57	32	0	0	0	11	COMMERCIAL/INDUSTRIAL COMBINED
WATERTOWN	71	13	0	0	0	16	1986 FIGURES COMMERCIAL/INDUSTRIAL COMBINED
WELLESLEY	66	22	0	0	0	12	
WESTON	90	-	-	-	-	10	
WESTWOOD	53	21	6	0	0	20	
WRENTHAM	45	2	6	-	-	46	
TOTAL:	44%	19%	7%	-	5%	25%	

- LESS THAN ONE PERCENT

In 1985, commercial water use was estimated at 18 percent in the basin, with the highest percentage in Cambridge and Waltham. Industrial water use was approximately 7 percent in the basin, with the highest percentages in Needham and Millis. The communities with significant "other" water use were Milford, which supplied 6 percent of its water to other communities and Boston which supplied 8 percent to municipal and institutional water users. Agricultural water use from the public water supply systems was minimal throughout the basin. Of the five communities reporting agricultural use from a public system, only Natick and Medway had an agricultural water use greater than 0.5 percent.

Water Use Definitions

The definitions for different water uses are as follows:

Residential -water used by individuals and families in houses, apartments, condominiums and mobile home parks

Commercial -water used by business other than industry

Industrial -water used by industries for processing, cooling, sanitary, etc.

Agricultural -water used by the farming industry for irrigation or livestock

Other -water wholesaled to other public water supply systems in or out of the community and metered public buildings and services

Unaccounted-for - unmetered use including water used by municipal buildings, system flushing and maintenance, leakage, fire fighting, etc.

Sources of Data

The percent distribution of water use for each water supply system was obtained from the 1985 "Water Supply Statistics Report" submitted by system superintendents to the regional offices of the DEQE, Division of Water Supply and/or interviews with local water supply officials.

5. Inflow - Outflow Analysis

The Charles River basin is a net exporter of water. For example, the City of Cambridge's water supply is obtained from sources in the Charles River basin and from the MWRA. Cambridge has a municipal sewage system covering the entire city, and this system discharges the wastewater effluent into the Atlantic Ocean. If one assumes for this analysis that all water supplied is collected through the sewage system and ultimately is discharged, then there is a net loss of the water supply originating in the Charles basin. However, this net loss occurs primarily in the lower basin, as most of the discharge from upper basin communities remains within the basin. Table 8 displays the basin of origin and discharge of the 1985 water supply for each community in the basin.

Of the 1985 public water supply systems' average day demand of 193 mgd, 31 mgd (16%) came from sources in the Charles basin, 153 mgd (79%) came from the MWRA, and 9 mgd (5%) came from other basins. Of the 24 communities in the basin, only six receive all of their water from public sources in the Charles basin, six receive all of their water from the MWRA, and the remainder from two or more basins.

Of the 1985 ADD of 193 mgd, 181 mgd (94%) was transferred out of the basin as wastewater. Of the 181 mgd, 179 mgd was discharged into the Massachusetts Coastal basin via the MWRA treatment plants at Nut and Deer Islands, 1 mgd into the Blackstone basin, and approximately 1 mgd into the Concord, Ten Mile, Taunton, and Neponset River basins. Approximately 12 mgd was discharged within the Charles River basin.

In total, 162 mgd entered the basin as water supply from sources located in other basins. Thirty-one mgd came from sources in the Charles River basin. Since 181 mgd was discharged from the basin as wastewater, there was a net outflow from the Charles River basin of 19 mgd.

TABLE 8
INFLOW - OUTFLOW
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

	BASIN OF WATER SUPPLY (1985 ADD)							BASIN OF WASTEWATER DISCHARGE (1985 ADD OF WATER SUPPLY)							
COMMUNITY	CHARLES	CONCORD	BLACKSTONE	TAUNTON	NEPONSET	MWRA	TOTAL 1985 ADD	CHARLES	CONCORD	BLACKSTONE	TEN MILE	TAUNTON	NEPONSET	OCEAN	TOTAL DISCHARGE
BELLINGHAM	0.29		0.97				1.26	0.66		0.60					1.26
BOSTON						119.26	119.26							119.26	119.26
BROOKLINE						7.37	7.37							7.37	7.37
CAMBRIDGE	15.06					0.53	15.59							15.59	15.59
DEDHAM	0.94				1.58		2.52						0.04	2.48	2.52
DOVER	0.05	0.02			0.04		0.11	0.09					0.02		0.11
FRANKLIN	2.03						2.03	2.03							2.03
HOLLISTON	1.01	0.01					1.02	1.02							1.02
LINCOLN	0.18	0.21					0.39	0.23	0.16						0.39
MEDFIELD	0.12				0.99		1.11	0.85					0.26		1.11
MEDWAY	0.73						0.73	0.73							0.73
MILFORD	2.93						2.93	2.70		0.23					2.93
MILLIS	0.55						0.55	0.55							0.55
NATICK	0.21	4.18					4.39	0.88	0.22					3.29	4.39
NEEDHAM	3.08					0.51	3.59	0.36						3.23	3.59
NEWTON						10.10	10.10							10.10	10.10
NORFOLK	0.24						0.24	0.24							0.24
SHERBORN															
WALTHAM						10.47	10.47							10.47	10.47
WATERTOWN						3.43	3.43							3.43	3.43
WELLESLEY	2.53						2.53							2.53	2.53
WESTON						1.16	1.16	1.16							1.16
WESTWOOD	0.91				0.33		1.24							1.24	1.24
WRENTHAM	0.56			0.37			0.93	0.40		0.23	0.02	0.28			0.93
TOTAL:	31.42	4.42	0.97	0.37	2.94	152.83	192.95	11.90	0.38	1.06	0.02	0.28	0.32	178.99	192.95
	16%	2%	1%		2%	79%	100%	6%		1%				93%	100%

V. DEMOGRAPHIC PROFILE OF THE STUDY AREA

1. Population and Population Trends

The Charles River basin had a 1980 population of 1,147,731 (U.S. Census). The 1985 State Census population of 1,147,442 showed an very slight increase of 356 persons during the five year period.

Boston is the principal population center of the basin. In 1985, Boston's 571,000 citizens accounted for 50 percent of the basin's population. Table 9 shows the area's population changes from 1940 to 1985. In the decade of the 1940's, the basin communities experienced an 8 percent increase in population followed by a decline in the area's population of approximately 3 percent during the 1950's. The population stabilized between 1960 and 1970, with the 1970 population of 1,245,726 only 1,442 more than the 1960 census population. The 1970's saw the basin's population decline further to 1,147,731, a drop of 8 percent.

TABLE 9
POPULATION TRENDS
CHARLES RIVER BASIN

COMMUNITY	FEDERAL CENSUS 1940	1950	1960	1970	1980	STATE CENSUS 1985	POPULATION CHANGE 1980 - 1985	PERCENT CHANGE 1980 - 1985
BELLINGHAM	2,979	4,100	6,774	13,967	14,300	13,677	(623)	(4)%
BOSTON*	770,816	801,444	697,197	641,071	562,994	571,000	8,006	1
BROOKLINE	49,786	57,589	54,044	58,689	55,062	58,152	3,090	6
CAMBRIDGE	110,879	120,740	107,716	100,361	95,322	86,865	(8,457)	(9)
DEDHAM	15,508	18,487	23,869	26,938	25,298	23,729	(1,569)	(6)
DOVER	1,374	1,722	2,846	4,529	4,703	4,581	(122)	(3)
FRANKLIN	7,303	8,037	10,530	17,830	18,217	17,865	(352)	(2)
HOLLISTON	3,000	3,753	6,222	12,069	12,622	12,606	-	
LINCOLN	1,783	2,427	5,613	7,567	7,098	6,902	(196)	(3)
MEDFIELD	4,384	4,549	6,021	9,821	10,220	10,330	110	1
MEDWAY	3,297	3,744	5,168	7,938	8,447	9,037	590	7
MILFORD	15,388	15,442	15,749	19,352	23,390	24,038	648	3
MILLIS	2,278	2,551	4,374	5,686	6,908	6,689	(219)	(3)
NATICK	13,851	19,838	28,831	31,057	29,461	30,280	819	3
NEEDHAM	12,445	16,313	25,793	29,748	27,901	27,870	-	
NEWTON	69,873	81,994	92,384	91,263	83,622	82,925	(697)	(1)
NORFOLK	2,294	2,704	3,471	4,656	6,363	8,210	1,847	29
SHERBORN	1,022	1,245	1,806	3,309	4,049	4,350	301	7
WALTHAM	40,020	47,187	55,413	61,582	58,200	57,955	-	
WATERTOWN	35,427	37,329	39,092	39,307	34,384	32,189	(2,195)	(6)
WELLESLEY	15,127	20,549	26,071	28,051	27,209	27,052	157	1
WESTON	3,590	5,026	8,261	10,870	11,169	10,743	(426)	(4)
WESTWOOD	3,376	5,837	10,354	12,750	13,212	13,174	-	
WRENTHAM	4,674	5,341	6,685	7,315	7,580	7,223	(356)	(4)
TOTAL:	1,190,474	1,287,948	1,244,284	1,245,726	1,147,731	1,147,442	356	3%

- = NEGLIGIBLE
* BOSTON SHOWS 1985 CENSUS FROM BOSTON WATER & SEWER COMMISSION
NOTE: PARENTHESES INDICATE DECREASES

2. Population Density

The City of Cambridge is the most densely populated community in the basin, with a 1985 population of 86,865 persons, or 12,252 persons per square mile, while Sherborn has the lowest density, 270 persons per square mile. Boston with 50.55 square miles has the most area, and with a population of 571,000, also is the most populous community. Sherborn with 4,350 persons has the fewest number of persons living within its borders, and Watertown, with only 4.14 square miles, has the least land area.

The six communities which are fully supplied by the MWRA account for approximately 72 percent of the area's population but only 29 percent of the land area. The remaining 28 percent of the population resides in 18 communities.

The 1985 state census population, land area in square miles, and the density of each community is shown in detail in Table 10.

Source of Data

Land area for each community was obtained from the Soil Conservation Service, U.S. Department of Agriculture. The population density figures were calculated by dividing the 1985 state census population figures by the land area.

TABLE 10
1985 MASSACHUSETTS CENSUS,
LAND AREA, AND DENSITY
CHARLES RIVER BASIN
(Arranged in descending order of size)

1985 Population*		Land Area (in square miles)		Density (persons/mi^2)	
Boston	601,095	Boston	50.55	Cambridge	12,252
Cambridge	86,865	Franklin	26.98	Boston	11,891
Newton	82,925	Wrentham	22.56	Brookline	8,552
Brookline	58,152	Holliston	19.06	Watertown	7,775
Waltham	57,955	Bellingham	18.91	Newton	4,564
Watertown	32,189	Newton	18.17	Waltham	4,243
Natick	30,280	Weston	17.32	Wellesley	2,576
Needham	27,870	Sherborn	16.14	Dedham	2,222
Wellesley	27,052	Natick	15.98	Needham	2,189
Milford	24,038	Dover	15.46	Natick	1,895
Dedham	23,729	Norfolk	15.32	Milford	1,603
Franklin	17,865	Milford	15.00	Westwood	1,188
Bellingham	13,677	Lincoln	14.96	Medway	774
Westwood	13,174	Medfield	14.64	Bellingham	723
Holliston	12,606	Waltham	13.66	Medfield	706
Weston	10,743	Needham	12.73	Franklin	662
Medfield	10,330	Millis	12.25	Holliston	661
Medway	9,037	Medway	11.67	Weston	620
Norfolk	8,210	Westwood	11.09	Millis	546
Wrentham	7,223	Dedham	10.68	Norfolk	536
Lincoln	6,902	Wellesley	10.50	Lincoln	461
Millis	6,689	Cambridge	7.09	Wrentham	320
Dover	4,581	Brookline	6.80	Dover	296
Sherborn	4,350	Watertown	4.14	Sherborn	270

* 1985 State Census

3. Seasonal Population

Seasonal population in the Charles River basin is not significant. The only community to report a seasonal population was Bellingham, where an estimated 200 additional people live during the summer season.

The total basin population for 1985 was 1,147,442. The seasonal population of 200 people represents less than a 0.02 percent increase in population.

Source of Data

The estimated increase in seasonal population has been calculated with information obtained from local water supply superintendents. Very little hard data is available to accurately approximate the distribution of seasonal population throughout the year. Gordian Associates, in the analysis entitled "Regional Solid Waste Alternatives for Martha's Vineyard" (1979), developed an equation to approximate the relationship between the winter and summer populations of the Island. In simple terms, it states that every 100 seasonal residents are equivalent to 18.75 year-round residents. (See Appendix 2 for a more complete discussion),

The peak seasonal population figure was obtained from water superintendents. This figure was multiplied by 0.1875 to obtain the seasonal population factor.

4. Service Population

Of the 1,147,442 persons living in the Charles River basin, 1,125,799, or 98 percent, obtain their water from a public water supply system. Eleven out of the twenty-four basin communities are 100 percent served by a public water supply system. Sherborn is the only basin community with no central water supply system. The town's population is served by on-site residential wells, and Sherborn is not expected to install a public water supply system in the foreseeable future.

Table 11 shows the percent of the population served by a central water supply system in 1985.

Sources of Data

The 1985 service population is the percent of the 1985 state census population that is served by a community's central water supply system(s). If a community's 1985 service population is 90 percent, it means that 90 percent of the population is on a central supply system, and the other 10 percent of the population is self-supplied, relying entirely on individual private wells.

TABLE 11
1985 POPULATION, SERVICE POPULATION AND PERCENT SERVICE POPULATION
CHARLES RIVER BASIN

COMMUNITY	1985 STATE CENSUS POPULATION	1985 SERVICE POPULATION	PERCENT SERVICE POPULATION
BELLINGHAM	13,677	13,304	97%
BOSTON*	571,000	571,000	100
BROOKLINE	58,152	58,152	100
CAMBRIDGE	86,865	86,865	100
DEDHAM	23,729	23,729	100
DOVER	4,581	1,237	27
FRANKLIN	17,865	16,793	94
HOLLISTON	12,606	11,345	90
LINCOLN	6,902	5,384	78
MEDFIELD	10,330	10,227	99
MEDWAY	9,037	8,676	96
MILFORD	24,038	23,557	98
MILLIS	6,689	6,355	95
NATICK	30,280	30,280	100
NEEDHAM	27,870	27,870	100
NEWTON	82,925	82,925	100
NORFOLK	8,210	3,366	41
SHERBORN	4,350	NO CENTRAL SUPPLY	
WALTHAM	57,955	57,955	100
WATERTOWN	32,189	32,189	100
WELLESLEY	27,052	25,158	93
WESTON	10,743	10,743	100
WESTWOOD	13,174	12,911	98
WRENTHAM	7,223	5,778	80
TOTAL:	1,147,442	1,125,799	98%

* BOSTON SHOWS 1985 CENSUS FROM BOSTON WATER & SEWER COMMISSION

5. Population Projections

The overall population of the Charles River basin is projected to remain quite stable during the next thirty-five years. The population projections prepared by the regional planning agencies and local governments indicate a population increase of 81,668 (7 percent) between 1985 and 2020 in the twenty-four basin communities (See Table 13).

During the 1985 to 2020 period, sixteen of the twenty-four basin communities are expected to experience an increase in population, four a decrease, and four a negligible increase.

The fully-supplied MWRA communities are expected to experience an four percent increase in population from 1985 to 2020. The remaining communities (non-MWRA and partially-supplied MWRA communities) are projected to have a twelve percent increase in population.

The communities projected to have the largest percentage and numerical increase and decrease in population between 1985 and 2020 are shown in Table 12.

Table 9 and Figure 5 show the population trends in the basin from 1940 to 2020. Table 13 shows the population projections from 1985 to 2020 for the basin communities with numerical and percentage changes.

Sources of Data

Population projections were obtained from the Metropolitan Area Planning Council (MAPC), except for Natick projections which were prepared by the town planning department, Boston projections which were obtained from the Boston Water and Sewer Commission, and Needham for which the MAPC projections were adjusted based on recent town census data.

The MAPC prepared population projections in five year increments through 2010 based on the 1980 Federal Census. Population projections for the year 2020 were derived by taking the projected growth rate between 2000, 2005 and 2010 and extending that projected change for the period between 2010 and 2020. The MAPC publication, Interim Population Forecast 1980 - 2010, January 1982, explains the agency's projection methodology and contains detailed explanatory charts and tables.

TABLE 12
PERCENTAGE AND NUMERICAL CHANGES IN POPULATION
CHARLES RIVER BASIN

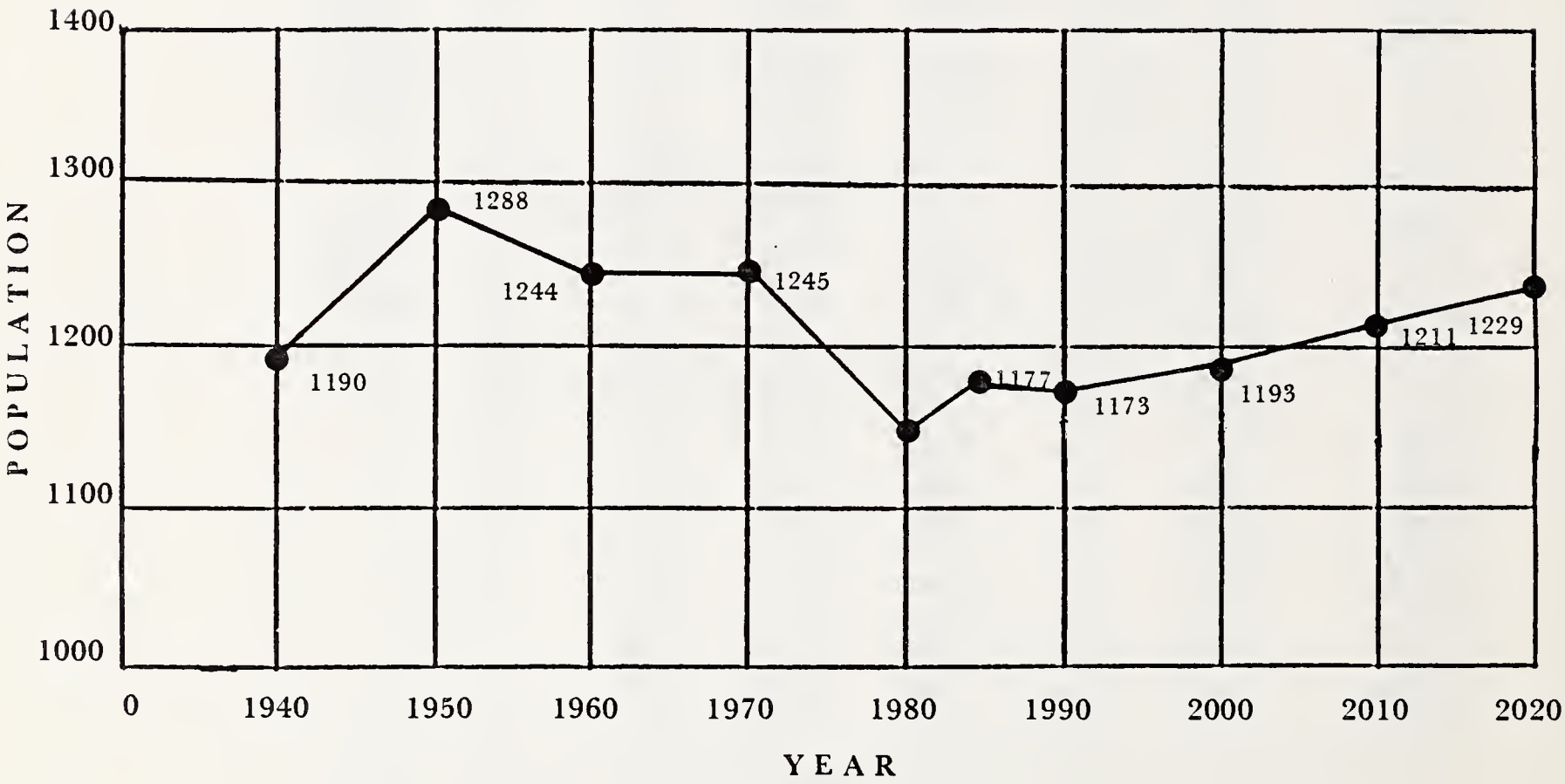
COMMUNITY	1985 - 2020 PERCENT INCREASE OR DECREASE IN POPULATION	1985 - 2020 NUMERICAL INCREASE OR DECREASE IN POPULATION	1985 STATE CENSUS POPULATION	PROJECTED 2020 POPULATION
	COMMUNITIES WITH LARGEST PERCENT INCREASE (1985 - 2020)			
FRANKLIN	44%	14,025	17,865	31,890
WRENTHAM	40	2,877	7,223	10,000
BELLINGHAM	37	8,013	13,677	21,690
NORFOLK	37	4,820	8,210	13,030
MILLIS	32	2,111	6,684	8,800
	COMMUNITIES WITH LARGEST NUMERICAL INCREASE (1985 - 2020)			
BOSTON	7%	42,000	571,000	613,000
FRANKLIN	44	14,025	17,865	31,890
BELLINGHAM	37	8,013	13,677	21,690
NORFOLK	37	4,820	8,210	13,030
MILFORD	12	2,962	24,038	27,000
	COMMUNITIES WHICH DECREASE			
BROOKLINE	9%	-5,052	58,152	53,100
NEWTON	3	-2,725	82,925	80,200
WATERTOWN	1	-389	32,189	31,800

TABLE 13
POPULATION PROJECTIONS
CHARLES RIVER BASIN

COMMUNITY	STATE CENSUS 1985	1990	2000	2010	2020	POPULATION CHANGE 1985 - 2020	PERCENT CHANGE 1985 - 2020
BELLINGHAM	13,677	15,830	18,310	20,000	21,690	8,013	37
BOSTON*	571,000	576,000	587,000	600,000	613,000	42,000	7
BROOKLINE	58,152	54,300	53,500	53,300	53,100	(5,052)	(9)
CAMBRIDGE	86,865	90,000	88,800	88,400	88,000	1,135	1
DEDHAM	23,729	24,300	24,300	24,300	24,300	571	2
DOVER	4,581	4,700	4,700	4,700	4,700	119	3
FRANKLIN	17,865	22,200	27,110	29,500	31,890	14,025	44
HOLLISTON	12,606	13,900	14,200	14,300	14,300	1,694	13
LINCOLN	6,902	7,100	7,100	7,100	7,100	198	3
MEDFIELD	10,330	11,800	12,200	12,300	12,400	2,070	20
MEDWAY	9,037	10,000	10,400	10,500	10,600	1,563	17
MILFORD	24,038	26,000	26,600	26,800	27,000	2,962	12
MILLIS	6,689	8,200	8,600	8,700	8,800	2,111	32
NATICK	30,280	31,900	32,500	33,000	33,000	2,720	9
NEEDHAM	27,870	29,000	29,000	29,000	29,000	1,130	4
NEWTON	82,925	81,900	80,700	80,400	80,200	(2,725)	(3)
NORFOLK	8,210	9,330	10,690	11,860	13,030	4,820	37
SHERBORN	4,350	5,100	5,500	5,600	5,700	1,350	31
WALTHAM	57,955	58,200	58,200	58,200	58,200	245	-
WATERTOWN	32,189	32,400	32,000	31,900	31,800	(389)	(1)
WELLESLEY	27,052	27,200	27,200	27,200	27,200	148	-
WESTON	10,743	10,800	10,800	10,800	10,800	57	-
WESTWOOD	13,174	13,200	13,200	13,200	13,200	26	-
WRENTHAM	7,223	9,500	9,900	10,000	10,100	2,877	40
TOTAL:	1,147,442	1,172,860	1,192,510	1,211,060	1,229,110	81,668	7%

- = NEGLIGIBLE
* BOSTON 1985 CENSUS FROM BOSTON WATER & SEWER COMMISSION

FIGURE 5
POPULATION 1940 - 2020
CHARLES RIVER BASIN
(1,000)



6. Projected Service Area Expansion

Eleven of the twenty-four basin communities serve 100 percent of their population. Thirteen basin communities have less than 100 percent of their populations on public water supply. By the year 2020 all communities are expected to be 100 percent served except Dover, Norfolk, Wellesley, and Wrentham. Norfolk shows an increase in its percent service population of 20 percent per decade (rather than 10 percent) based on their existing Master Plan recommendations. Wellesley and Wrentham are not expected to reach 100 percent because educational facilities in these communities are expected to remain self-supplied. Sherborn is not expected to install a public water supply system during the study period. Further explanation of the service area expansion is found under the Water Demand Projection Assumption section. Table 14 lists the 1985 and the projected 2020 service population for each community in the basin.

It is anticipated that in communities where the service population is less than 100 percent of the community's census population, the percentage of people served will increase during the planning period. The estimates of service area growth were developed from discussions with local water supply system managers and from historical experience about the way service areas develop in response to, or in anticipation of, population growth within a community.

For planning purposes, it was assumed that:

1. Those communities with a 100 percent service population in 1985 will remain at 100 percent through the planning period to the year 2020.
2. Those communities with a 1985 service population of 90 percent or more will increase 5 percent a decade with all reaching 100 percent by the year 2000.
3. Those communities with a service population of less than 90 percent are adjusted on an individual basis, based upon estimates of service area growth to 1990, as reported by the water system managers, and then increased by 10 percent per decade until the year 2020.

Table 15 shows how these communities are expected to increase the percentage of the population served during the thirty-five year study period.

TABLE 14
2020 SERVICE POPULATION PROJECTIONS
CHARLES RIVER BASIN

	1985			2020		
COMMUNITY	STATE CENSUS	PERCENT SERVED	SERVICE POPULATION	PROJECTED POPULATION	PERCENT SERVED	SERVICE POPULATION
BELLINGHAM*	13,677	97%	13,304	21,690	100%	21,690
BOSTON**	571,000	100	571,000	613,000	100	613,000
BROOKLINE	58,152	100	58,152	53,100	100	53,100
CAMBRIDGE	86,865	100	86,865	88,000	100	88,000
DEDHAM	23,729	100	23,729	24,300	100	24,300
DOVER	4,581	27	1,237	4,700	57	2,679
FRANKLIN	17,865	94	16,793	31,890	100	31,890
HOLLISTON	12,606	90	11,345	14,300	100	14,300
LINCOLN	6,902	78	5,384	7,100	100	7,100
MEDFIELD	10,330	99	10,227	12,400	100	12,400
MEDWAY	9,037	96	8,676	10,600	100	10,600
MILFORD	24,038	98	23,557	27,000	100	27,000
MILLIS	6,689	95	6,355	8,800	100	8,800
NATICK	30,280	100	30,280	33,000	100	33,000
NEEDHAM	27,870	100	27,870	29,000	100	29,000
NEWTON	82,925	100	82,925	80,200	100	80,200
NORFOLK	8,210	41	3,366	13,030	86	11,206
SHERBORN	4,350	NO CENTRAL SUPPLY		5,700	0	0
WALTHAM	57,955	100	57,955	58,200	100	58,200
WATERTOWN	32,189	100	32,189	31,800	100	31,800
WELLESLEY	27,052	93	25,158	27,200	93	25,296
WESTON	10,743	100	10,743	10,800	100	10,800
WESTWOOD	13,174	98	12,911	13,200	100	13,200
WRENTHAM	7,223	80	5,778	10,100	89	8,989
TOTAL:	1,147,442	98%	1,125,799	1,229,110	99%	1,216,550

* BELLINGHAM HAS A SEASONAL POPULATION OF 200, WHICH, MULTIPLIED BY THE FACTOR OF .1875 AND ADDED TO THE PERMANENT SERVICE POPULATION YIELDS THE SERVICE POPULATION

** BOSTON 1985 CENSUS FROM BOSTON WATER & SEWER COMMISSION

TABLE 15

Increase in Percent Service Population

Charles River Basin

Community	1985	1990	2000	2010	2020
Bellingham	97	97	100	100	100
Dover	27	27	37	47	57
Franklin	94	94	99	100	100
Holliston	90	90	99	100	100
Lincoln	78	78	86	94	100
Medfield	99	99	100	100	100
Medway	96	96	100	100	100
Milford	98	100	100	100	100
Millis	95	95	100	100	100
Norfolk	41	50	60	72	86
Wellesley	93	93	93	93	93
Westwood	98	100	100	100	100
Wrentham	80	80	85	85	89

VI. PROJECTED WATER DEMANDS

By the year 2020, the average day demand of communities in the basin is estimated to reach 249 mgd. For planning purposes, public water supply systems will need to be able to supply approximately 275 mgd to residents, businesses, industries, and other users in the Charles basin. This planning figure assumes that towns relying primarily on ground water will need sufficient water supply sources for their projected maximum day demand. See the following section for more detailed discussion.

The projected increase in demand on all basin communities' public water supply systems is tied directly to changes in population, service area, per capita use, and growth in the industrial and commercial sector. It is assumed that the relative proportion of water used by residents, businesses, industries, agriculture, and other users will not change significantly during the planning period.

Some communities may experience a significant change in water demand during the planning period, if a large water-intensive industry or processing facility opens or closes in the area. Where this information was known, the anticipated change in water use was added to or subtracted from the projected water use for the community.

The average day demand of the basin communities is projected to increase from 202 mgd to 249 mgd, about 23 percent between 1980-1985 and 2020. The demand for planning purposes for the basin communities is projected to increase from 221 mgd to 275 mgd, about 24 percent between 1980-1985 and 2020. The water demand for public water supply systems in the Charles River basin, as shown below, will increase between 1985 and 2020.

Demand on Public Water Supply Systems

	1980-85 Six Year Avg.	2020 (Projected)	Percent Increase
Average Day Demand	202.04 mgd	248.66 mgd	23%
Maximum Day Demand	319.48 mgd	392.52 mgd	23%
Demand for Planning Purposes	221.38 mgd	275.28 mgd	24%

The communities projected to have the largest percentage and volume increases in average day demand water use between 1980-1985 and 2020 are shown below:

Community	1980-85 to 2020 Percent Increase In Water Use (ADD)	1980-85 to 2020 Increase In Average Day Demand (mgd)
	Communities with largest percent increase (1985-2020)	
Norfolk	281%	0.62
Dover	145%	0.16
Franklin	119%	2.36
Bellingham	89%	1.01
Wrentham	87%	0.66
	Communities with largest volume increase (1985-2020)	
Boston	23%	29.63
Cambridge	16%	2.81
Franklin	119%	2.36
Waltham	16%	1.60
Newton	11%	1.24

Table 16 and 17 list the 1990-2020 projected average and maximum day demands for each community in the basin.

Water Demand Projection Assumptions

For planning purposes, the projections should not be regarded as exact numbers, but rather as estimates of future water demand. These estimates are based on the following assumptions representing DWR's forecast of what will occur during the next 35 years.

The population forecasts prepared by the Metropolitan Area Planning Council (MAPC), the Natick Planning Department, and the Boston Water and Sewer Commission, were prepared with specific local knowledge of the growth pattern of the individual communities and therefore are considered sound and reliable. These studies indicate that the Charles basin will experience an overall increase in population of seven percent during the planning period, 1985-2020.

Public water supply service areas will expand during the next 35 years. In communities where more than 90 percent of the population is served, the percentage will increase to 100 percent except for Wellesley where Wellesley College is expected to remain self-supplied. Those communities currently under 90 percent will increase 10 percent per decade from 1990 to 2020

TABLE 16
1990-2020 AVERAGE DAY DEMAND PROJECTIONS
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	SIX YEAR AVERAGE 1980 - 1985	1990	2000	2010	2020	VOLUME INCREASE FROM 1980 - 85 TO 2020	PERCENT INCREASE FROM 1980 - 85 TO 2020
BELLINGHAM	1.14	1.32	1.60	1.89	2.15	1.01	89%
BOSTON	126.29	127.40	136.32	145.97	155.92	29.63	23
BROOKLINE	7.01	6.55	6.77	7.07	7.36	0.35	5
CAMBRIDGE	17.05	17.67	18.30	19.09	19.86	2.81	16
DEDHAM	2.50	2.56	2.69	2.82	2.94	0.44	18
DOVER	0.11	0.11	0.16	0.22	0.27	0.16	145
FRANKLIN	1.99	2.47	3.34	3.85	4.35	2.36	119
HOLLISTON	1.01	1.11	1.26	1.40	1.46	0.45	40
LINCOLN	0.44	0.45	0.51	0.59	0.67	0.23	52
MEDFIELD	1.00	1.14	1.26	1.33	1.40	0.40	40
MEDWAY	0.72	0.80	0.91	0.96	1.01	0.29	40
MILFORD	2.67	2.89	3.17	3.34	3.52	0.85	32
MILLIS	0.64	0.78	0.91	0.96	1.02	0.38	59
NATICK	4.20	4.43	4.74	5.05	5.28	1.08	26
NEEDHAM	3.59	3.74	3.92	4.11	4.30	0.71	20
NEWTON	11.01	10.87	11.25	11.74	12.25	1.24	11
NORFOLK	0.22	0.30	0.44	0.61	0.84	0.62	281
SHERBORN			NO CENTRAL SUPPLY				
WALTHAM	10.57	10.61	11.15	11.68	12.21	1.64	16
WATERTOWN	3.99	4.02	4.16	4.35	4.53	0.54	14
WELLESLEY	2.70	2.71	2.85	2.99	3.12	0.42	16
WESTON	1.12	1.13	1.18	1.24	1.29	0.17	15
WESTWOOD	1.23	1.23	1.29	1.35	1.41	0.18	15
WRENTHAM	0.84	1.10	1.28	1.36	1.50	0.66	79
TOTAL:	202.04	205.39	219.46	233.97	248.66	46.62	23%

TABLE 17
1990 - 2020 MAXIMUM DAY DEMAND PROJECTIONS
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	1980 - 1985	1990	2000	2010	2020
BELLINGHAM	2.12	2.45	2.98	3.52	3.99
BOSTON	190.49	192.16	205.62	220.18	235.18
BROOKLINE	12.88	12.03	12.44	12.99	13.53
CAMBRIDGE	23.45	24.30	25.17	26.25	27.32
DEDHAM	3.74	3.83	4.02	4.21	4.40
DOVER	0.14	0.14	0.21	0.28	0.35
FRANKLIN	2.81	3.49	4.72	5.43	6.14
HOLLISTON	2.22	2.45	2.77	3.08	3.22
LINCOLN	0.84	0.86	0.97	1.13	1.27
MEDFIELD	2.22	2.54	2.79	2.94	3.10
MEDWAY	1.46	1.62	1.84	1.94	2.05
MILFORD	3.81	4.12	4.52	4.77	5.02
MILLIS	1.29	1.58	1.83	1.94	2.05
NATICK	7.96	8.40	8.99	9.56	10.00
NEEDHAM	7.98	8.30	8.72	9.13	9.55
NEWTON	21.70	21.43	22.17	23.14	24.13
NORFOLK	0.30	0.42	0.60	0.84	1.15
SHERBORN	NO CENTRAL SUPPLY				
WALTHAM	15.93	16.05	16.85	17.65	18.40
WATERTOWN	6.48	6.52	6.76	7.06	7.36
WELLESLEY	4.91	4.94	5.18	5.43	5.68
WESTON	2.80	2.81	2.96	3.10	3.24
WESTWOOD	1.86	1.86	1.95	2.04	2.13
WRENTHAM	1.82	2.39	2.78	2.94	3.26
TOTAL:	319.21	346.84	346.84	369.55	392.52

except for Norfolk which is projected by local water officials to increase 20 percent per decade and Wrentham where the Wrentham State School is expected to remain self-supplied.

On-going conservation efforts have reduced water use and future efforts will continue to do so. While the level of savings will differ from community to community, it is expected that conservation will offset the normal increases in per capita demand throughout the 1980's. This will result in the gallons per capita day remaining at the 1985 level until 1990. From 1990 to 2020 the gallons per capita day will increase five percent per decade.

The Projected Year 2020 Water Demand for Planning Purposes

For planning purposes, the 2020 average day demand will be used for communities that receive at least 50 percent of their water supply from surface water. For communities receiving 50 percent or more of their water supply from ground water, the projected 2020 maximum day demand will be used. The main reason for using the maximum day demand in the latter case is that communities that rely largely or entirely on ground water sources generally lack significant storage capacity and would need to have sufficient supply to meet their projected maximum day demand.

Table 18 lists the 2020 ADD, 2020 MDD, and 2020 Demand for Planning Purposes for the basin communities.

Water Demand Projection Methodology

The water demand projection methodology (see Appendix 2) reflects anticipated changes in service population, per capita demand, demand management, and characteristics of the individual communities.

Appendix 2 contains a detailed explanation of each step in the methodology. Table 19 illustrates the various 2020 demand components based on the methodology assumptions. Figure 6 contains the 2020 Water Demand Projection assumptions and Table 20, the actual 2020 Water Demand Projections. Figure 7 illustrates the historical and projected demand of the Charles water supply systems.

TABLE 18
PROJECTED DEMAND FOR PLANNING PURPOSES
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	1980 - 1985 AVERAGE DAY DEMAND	2020 AVERAGE DAY DEMAND	1980 - 1985 MAXIMUM DAY DEMAND	2020 MAXIMUM DAY DEMAND	1980 - 1985 DEMAND FOR PLANNING PURPOSES	2020 DEMAND FOR PLANNING PURPOSES
BELLINGHAM	1.14	2.15	2.12	3.99	2.12	3.99
BOSTON	126.29	155.92	190.49	235.18	126.29	155.92
BROOKLINE	7.01	7.36	12.88	13.53	7.01	7.36
CAMBRIDGE	17.05	19.86	23.45	27.32	17.05	19.86
DEDHAM	2.50	2.94	3.74	4.40	3.74	4.40
DOVER	0.11	0.27	0.14	0.35	0.14	0.35
FRANKLIN	1.99	4.35	2.81	6.14	2.81	6.14
HOLLISTON	1.01	1.46	2.22	3.22	2.22	3.22
LINCOLN	0.44	0.67	0.84	1.27	0.84	1.27
MEDFIELD	1.00	1.40	2.22	3.10	2.22	3.10
MEDWAY	0.72	1.01	1.46	2.05	1.46	2.05
MILFORD	2.67	3.52	3.81	5.02	2.67	3.52
MILLIS	0.64	1.02	1.29	2.05	1.29	2.05
NATICK	4.20	5.28	7.96	10.00	7.96	10.00
NEEDHAM	3.59	4.30	7.98	9.55	7.98	9.55
NEWTON	11.01	12.25	21.70	24.13	11.01	12.25
NORFOLK	0.22	0.84	0.30	1.15	0.30	1.15
SHERBORN			NO CENTRAL SUPPLY			
WALTHAM	10.57	12.21	15.93	18.40	10.57	12.21
WATERTOWN	3.99	4.53	6.48	7.36	3.99	4.53
WELLESLEY	2.70	3.12	4.91	5.68	4.91	5.68
WESTON	1.12	1.29	2.80	3.24	1.12	1.29
WESTWOOD	1.23	1.41	1.86	2.13	1.86	2.13
WRENTHAM	0.84	1.50	1.82	3.26	1.82	3.26
TOTAL:	202.04	248.66	319.21	392.52	221.38	275.28

TABLE 19
2020 WATER DEMAND COMPONENTS
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

COMMUNITY	2020 SERVICE POPULATION	2020 BASE AVERAGE DAY DEMAND	2020 AVERAGE DAY DEMAND TO REFLECT SERVICE AREA EXPANSION	2020 AVERAGE DAY DEMAND TO REFLECT 15 PERCENT GPCD INCREASE	2020 MAXIMUM DAY DEMAND	2020 DEMAND FOR PLANNING PURPOSES
BELLINGHAM	21,690	1.81	1.87	2.15	3.99	3.99
BOSTON	613,000	135.58	135.58	155.92	235.18	155.92
BROOKLINE	53,100	6.40	6.40	7.36	13.53	7.36
CAMBRIDGE	88,000	17.27	17.27	19.86	27.32	19.86
DEDHAM	24,300	2.56	2.56	2.94	4.40	4.40
DOVER	2,679	0.11	0.24	0.27	0.35	0.35
FRANKLIN	31,890	3.55	3.78	4.35	6.14	6.14
HOLLISTON	14,300	1.15	1.27	1.46	3.22	3.22
LINCOLN	7,100	0.45	0.58	0.67	1.27	1.27
MEDFIELD	12,400	1.20	1.22	1.40	3.10	3.10
MEDWAY	10,600	0.84	0.88	1.01	2.05	2.05
MILFORD	27,000	3.00	3.06	3.52	5.02	3.52
MILLIS	8,800	0.84	0.89	1.02	2.05	2.05
NATICK	33,000	4.59	4.59	5.28	10.00	10.00
NEEDHAM	29,000	3.74	3.74	4.30	9.55	9.55
NEWTON	80,200	10.65	10.65	12.25	24.13	12.25
NORFOLK	11,206	0.35	0.73	0.84	1.15	1.15
SHERBORN			NO CENTRAL SUPPLY			
WALTHAM	58,200	10.61	10.61	12.21	18.40	12.21
WATERTOWN	31,800	3.94	3.94	4.53	7.36	4.53
WELLESLEY	25,296	2.71	2.71	3.12	5.68	5.68
WESTON	10,800	1.13	1.13	1.29	3.24	1.29
WESTWOOD	13,200	1.20	1.23	1.41	2.13	2.13
WRENTHAM	8,989	1.17	1.31	1.50	3.26	3.26
TOTAL:	1,216,550	214.87	216.23	248.66	392.52	275.28

Figure 6

PROJECTION ASSUMPTIONS
2020 Water Demand for Public Water Supply Systems

Charles River Basin

Basic Formula

(2020 Service Population X 2020 GPCD) + Extraordinary changes in industrial water use = 2020 ADD

Major Projection Assumptions

2020 Service Population	2020 Gallons Per Capita Day	Extraordinary changes
1. 2020 Regional Planning Agency projections 2. Projection refinements by local planning departments. 3. Seasonal population factor 4. Service Population a. 1990 service population as projected by the cities/towns b. 1990-2020: 10% increase in percent service population per decade until 100% is reached	1. 1980-1985 base gpcd 2. No increase in gpcd 1985 to 1990 due to conservation 3. 5% increase in gpcd per decade 1990 - 2020 4. Increase in water use by existing commercial and industrial users reflected in increased GPCD	1. Increase or decrease in water use because of new or large industrial water users: e.g. new fish processing or computer hardware manufacturing plant.

TABLE 20
2020 WATER DEMAND PROJECTIONS
CHARLES RIVER BASIN
MILLION GALLONS PER DAY (MGD)

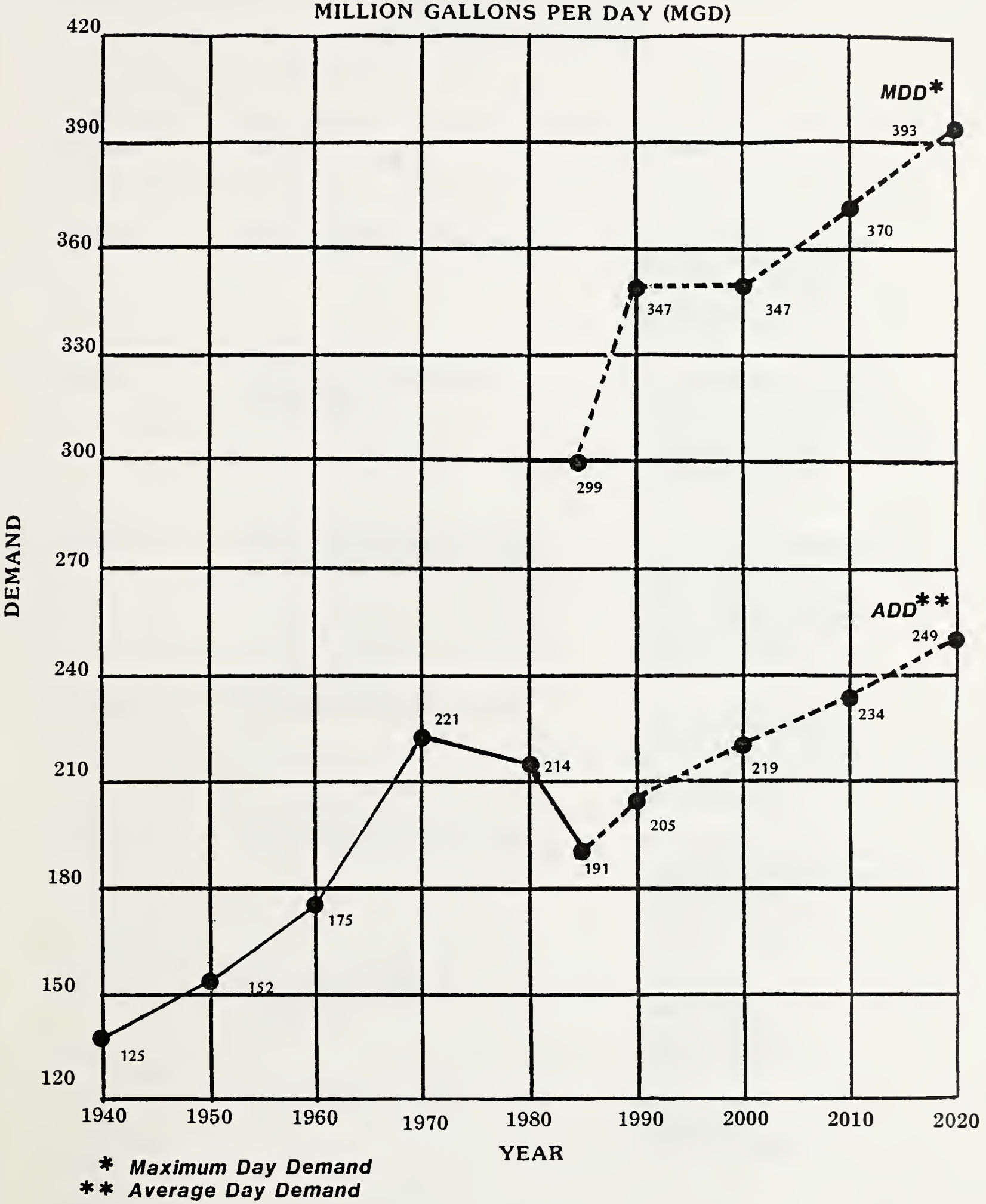
COMMUNITY	1985 CENSUS POPULATION	1985 PERCENT SERVICE POPULATION	1985 SEASONAL POPULATION	1985 BASE SERVICE POPULATION	1980-85 AVERAGE GPCD	1980-85 ADD	2020 POPULATION PROJECTION	2020 SERVICE POPULATION	2020 BASE ADD	2020 PERCENT SERVICE POPULATION	2020 ADJUSTED SERVICE POPULATION	2020 ADJUSTED ADD	2020 GPCD	2020 ADJUSTED ADD	1980-85 MDD	1980-85 MDD/ADD RATIO	2020 MDD	DEMAND FOR PLANNING PURPOSES
BELLINGHAM	13,677	97%	200	13,304	86	1.14	21,690	21,039	1.81	100%	21,690	1.87	99	2.15	2.12	1.86	3.99	3.99
BOSTON	571,000	100%		571,000	221	126.29	613,000	613,000	135.58	100%	613,000	135.58	254	155.92	190.49	1.51	235.18	155.92
BROOKLINE	58,152	100%		58,152	121	7.01	53,100	53,100	6.40	100%	53,100	6.40	139	7.36	12.88	1.84	13.53	7.36
CAMBRIDGE	86,865	100%		86,865	196	17.05	88,000	88,000	17.27	100%	88,000	17.27	226	19.86	23.45	1.38	27.32	19.86
DEDHAM	23,729	100%		23,729	105	2.50	24,300	24,300	2.56	100%	24,300	2.56	121	2.94	3.74	1.50	4.40	4.40
DOVER	4,581	27%		1,237	89	0.11	4,700	1,269	0.11	57%	2,679	0.24	102	0.27	0.14	1.27	0.35	0.35
FRANKLIN	17,865	94%		16,793	119	1.99	31,890	29,977	3.55	100%	31,890	3.78	136	4.35	2.81	1.41	6.14	6.14
HOLLISTON	12,606	90%		11,345	89	1.01	14,300	12,870	1.15	100%	14,300	1.27	102	1.46	2.22	2.20	3.22	3.22
LINCOLN	6,902	78%		5,384	82	0.44	7,100	5,538	0.45	100%	7,100	0.58	94	0.67	0.84	1.91	1.27	1.27
MEDFIELD	10,330	99%		10,227	98	1.00	12,400	12,276	1.20	100%	12,400	1.22	113	1.40	2.22	2.22	3.10	3.10
MEDWAY	9,037	96%		8,676	83	0.72	10,600	10,176	0.84	100%	10,600	0.88	95	1.01	1.46	2.03	2.05	2.05
MILFORD	24,038	98%		23,557	113	2.67	27,000	26,460	3.00	100%	27,000	3.06	130	3.52	3.81	1.43	5.02	3.52
MILLIS	6,689	95%		6,355	101	0.64	8,800	8,360	0.84	100%	8,800	0.89	116	1.02	1.29	2.02	2.05	2.05
NATICK	30,280	100%		30,280	139	4.20	33,000	33,000	4.59	100%	33,000	4.59	160	5.28	7.96	1.90	10.00	10.00
NEEDHAM	27,870	100%		27,870	129	3.59	29,000	29,000	3.74	100%	29,000	3.74	148	4.30	7.98	2.22	9.55	9.55
NEWTON	82,925	100%		82,925	133	11.01	80,200	80,200	10.65	100%	80,200	10.65	153	12.25	21.70	1.97	24.13	12.25
NORFOLK	8,210	41%		3,366	65	0.22	13,030	5,342	0.35	86%	11,206	0.73	75	0.84	0.30	1.36	1.15	1.15
SHERBORN	4,350	NO CENTRAL SUPPLY					5,700											
WALTHAM	57,955	100%		57,955	182	10.57	58,200	58,200	10.61	100%	58,200	10.61	210	12.21	15.93	1.51	18.40	12.21
WATERTOWN	32,189	100%		32,189	124	3.99	31,800	31,800	3.94	100%	31,800	3.94	143	4.53	6.48	1.62	7.36	4.53
WELLESLEY	27,052	93%		25,158	107	2.70	27,200	25,296	2.71	93%	25,296	2.71	123	3.12	4.91	1.82	5.68	5.68
WESTON	10,743	100%		10,743	104	1.12	10,800	10,800	1.13	100%	10,800	1.13	120	1.29	2.80	2.50	3.24	1.29
WESTWOOD	13,174	98%		12,911	93	1.23	13,200	12,936	1.20	100%	13,200	1.23	107	1.41	1.86	1.51	2.13	2.13
WRENTHAM	7,223	80%		5,778	145	0.84	10,100	8,080	1.17	89%	8,989	1.31	167	1.50	1.82	2.17	3.26	3.26
TOTAL:	1,147,442	98%	200	1,125,798	2,725	202.04	1,229,110	1,201,019	214.87	98%	1,216,550	216.23	3,134	248.66	319.21	41.14	392.52	275.28

FIGURE 7

HISTORICAL AND PROJECTED DEMAND

CHARLES RIVER BASIN

MILLION GALLONS PER DAY (MGD)



* Maximum Day Demand

** Average Day Demand

APPENDIX 1

CHARLES RIVER BASIN

WATER SUPPLY AGENCIES

Community	Agency	Contact
Bellingham	Bellingham Water Department	Mr. Jean P. Trudel, Supt. Bellingham Water Dept. 200 Wrentham Road Bellingham, MA 02019 (508) 883-7803
Boston	Boston Water and Sewer Commission	Mr. Patrick Joseph Foley Engineering Services Adm. Boston Water & Sewer Comm. 425 Summer Street Boston, MA 02210 (617) 330-9400
Brookline	Brookline Department of Public Works, Water Division	Mr. Andrew Pappastergion Water Division Dept. of Public Works 333 Washington Street Brookline, MA 02146 (617) 730-2170
Cambridge	Cambridge Water Department	Mr. John J. Cusack, Supt. Cambridge Water Dept. 250 Fresh Pond Parkway Cambridge, MA 02138 (617) 498-9070
Dedham	Dedham-Westwood Water District	Mr. Robert Eiben, Manager Dedham/Westwood Water Dist. P.O. Box 9137 Dedham, MA 02026 (617) 329-7090
Dover	Town of Dover Water Department	Josef Fryer Town Hall Dover, MA 02030 (508) 785-0463
	Dover Water Works, Inc.	William Lee 5 Picardy Ln. Dover, MA 02030

Community	Agency	Contact
	Meadowbrook Water Trust	J. Chapman (508) 785-1396
	Dover Water Company	85 Walpole St. Dover, MA 02030 (508) 785-0052
	Octagon Realty Trust	7 Comisky Rd. Dover, MA 02030 (508) 785-1505
	Glen Ridge Residents Trust	O.F. Pyle Box 304 Dover, MA 02030
	McNamara Water	E. Sullivan 5 Old Farm Rd. Dover, MA 02030 (508) 785-0600
	Bedell Water	Laurence Bedell (508) 785-9834
Franklin	Franklin Department of Public Works	Mr. Gerald Fagan DPW Director Dept. of Public Works 150 Emmons St. Franklin, MA 02038 (508) 528-1570
Holliston	Holliston Water Department	Mr. Joseph M. Finn, Supt Holliston Water Dept. 703 Washington St. Holliston, MA 01746 (508) 429-5721

Community	Agency	Contact
Lincoln	Lincoln Water Department	Mr. Richard P. Carroll Lincoln Water Dept. Town Hall Lincoln, MA 01773 (617) 259-8999
Medfield	Medfield Street, Water and Sewer Department	Mr. Kenneth Feeney, Supt. 459 Main St. Town Hall Water & Sewer Dept. Medfield, MA 02052 (508) 359-8505
Medway	Medway Water Department	Mr. Mark Flaherty, Supt. Medway Water Dept. 155 Village St. Medway, MA 02053 (508) 533-8393
Milford	Milford Water Company	Mr. Henry Papuga, Man. Milford Water Co. 42B Dilla Street, P.O. Box T Milford, MA 01757 (508) 473-5110
Millis	Millis Department of Public Works	Mr. Robert Leslie, Supt. Millis DPW 7 Water Street Millis, MA 02054 (508) 376-5424
Natick	Natick Water Department	Mr. Edwin Fannon, Adm. Supt. Natick Water Dept. 44 Middlesex Ave. Natick, MA 01760 (508) 653-2710
Needham	Needham Department of Public Works, Water Division	Mr. Bruce Nagler, Supt. Needham Public Works Water Division P.O. Box 364 (617) 444-5100
Newton	Newton Water Department	Mr. William MacEwen Newton Water Dept. 1000 Commonwealth Ave. Newton, MA 02159 (617) 552-7073

Community	Agency	Contact
Norfolk	Norfolk Water Department	Mr. James Martin III, Supt. Norfolk Water Dept. P.O. Box 264 Norfolk, MA 02056 (617) 528-1412
Sherborn	None	
Waltham	Waltham Department of Public Works, Water Division	Mr. Edward Delaney, P.E. Dir. of Public Works 119 School Street Waltham, MA 02154 (617) 893-4040
Watertown	Watertown Department of Public Works	Mr. James P. Clark, Supt. Watertown DPW Administration Building Main Street Watertown, MA 02172 (617) 924-1980
Wellesley	Wellesley Department of Public Works, Water and Sewer Division	Mr. Joseph B. Duggan Assistant Superintendent DPW, Water Division P.O. Box 364 Wellesley Hills, MA 02181 (617) 235-7600
Weston	Weston Water Department	Mr. John Columbo, Supt. Weston Water Dept. 71 Warren Avenue Weston, MA 02193 (617) 893-2363
Westwood	See Dedham-Westwood Water District	
Wrentham	Wrentham Department of Public Works, Water Division	Mr. Everett Skinner, Supt. Wrentham DPW Water Division Taunton St. - P.O. Box 658 Wrentham, MA 02093 (508) 384-7777

APPENDIX 2. GENERAL WATER DEMAND PROJECTION METHODOLOGY

The methodology used to project water demand for the period 1990-2020 is described in this section. Twenty-two separate steps are involved in this methodology. The purpose for each step, source of information, and formula, if applicable, are described. The projected water demands produced by this methodology are accurate as long as the assumptions underlying the various steps remain valid. For example, the methodology uses population projections prepared by the Massachusetts Regional Planning Agencies. If actual population growth is substantially different from these projections, the projected water demands also will be different.

The assumptions built into this methodology are based on analyses of future trends from the literature, consultants' reports, and a review of recent water demand fluctuations and conservation efforts in Massachusetts.

The twenty-two steps are as follows:

1. Identification of communities included in the basin
2. 1985 state census population
3. 1985 percent service population
4. 1985 seasonal population
5. 1985 base service population
6. 1980-1985 average day demand
7. 1980-1985 annual average gallons per capita per day (Part1)
8. 2020 population projections
9. 2020 minimum service population
10. 2020 base average day demand
11. 2020 increase in percent service population
12. 2020 adjusted service population (Part 1)
13. Local population refinements
14. 2020 adjusted service population (Part 2)
15. 2020 gallons per capita per day (Part 2)
16. Preliminary adjusted 2020 average day demand
17. Significant changes anticipated in water use
18. Adjusted 2020 average day demand
19. 1980-1985 maximum day demand

20. 1980-1985 MDD to ADD ratio
21. 2020 maximum day demand
22. 2020 demand for planning purposes

Step 1: Communities Included in Study Area

A community is included in the river basin study area if it is located mostly within the basin or if it uses the basin as a source of public water supply. Therefore, communities that are not geographically located within the basin may be included in the study area.

Step 2: 1985 State Census Population

The 1985 state census population figures, obtained from the Massachusetts Census Bureau, Office of the Secretary of State, include all persons who indicated a particular city or town as their usual place of residence. Members of the Armed Forces living on a military installation were counted as residents of the community in which the installation is located; college students were counted as residents of the community in which they were living while attending college; and inmates of institutions who normally live there for a considerable period of time were counted as residents of the community where the institution is located.

Step 3: 1985 Service Population

This figure represents the percentage of the community's population that is served by a central water supply system in 1985. A 90 percent service population means that 90 percent of the community is on a central supply system, and the other 10 percent is self-supplied (relying entirely on individual private wells) or is being supplied by connections with other water systems.

This figure was obtained from the updated Municipal Water Resources Management Plan - Phase II questionaire and confirmed by DWR personnel in interviews with water superintendents.

Step 4: 1985 Seasonal Population and/or Out-of-Town Population

Some Basin communities have significant seasonal populations. In order to calculate an accurate annual average gallons per capita per day (GPCD) and future water demand, it is necessary to estimate an adjusted service population which reflects the increased seasonal population.

Local water superintendents or community planning boards usually can estimate the peak seasonal population but have little hard data with which to estimate the distribution of the seasonal population. Gordian Associates (1979) in their analysis of Regional Solid Waste Alternatives for Martha's Vineyard found that the relationship between the winter and summer populations is similar to a bell-shaped curve, with the July population representing the highest point on the curve. The August population is approximately 75 percent of the July peak, and the September and June populations are 25 percent of the peak July population. From October to May the population remains constant at the year-round figure. Gordian Associates developed a formula which approximates this relationship and, in simple terms, states that every 100 seasonal residents is equivalent to 18.75 persons using water service on a year-round basis.

Peak seasonal population was obtained from the 1982 Municipal Water Resources Management Plan - Phase II questionaire and updated and verified by the water superintendent. This figure was multiplied by 0.1875 to obtain the seasonal population factor.

Out-of-town population is defined as any population outside of a community that is served by the community's central water supply system. In these cases, care was taken to subtract this population from the service population of their resident communities to avoid double counting. For planning purposes, it is assumed that the seasonal and out-of-town populations of the basin will remain constant throughout the planning period, unless other specific information is available.

Step 5: Base Service Population

The population figures obtained in Steps Three and Four were added to obtain the 1985 Base Service Population.

Step 6: 1980-1985 Average Day Demand

The 1980-1985 Average Day Demand (ADD) was obtained by dividing the water supply systems' 1980-1985 net water consumption by 365 (366 in the 1980 and 1984 leap years). Net water consumption figures were obtained from the Division of Water Supply (DEQE) "Water Supply Statistics" forms. These forms are submitted to DEQE by each water supply agency in the spring and report the total amount of water pumped by the system for the previous calendar year. Net water consumption is the water pumped from the system's own sources plus water purchased from other systems minus water sold to other systems.

ADD, in millions of gallons per day (mgd), represents the total average daily water consumption. This includes domestic, commercial, institutional, industrial, agricultural, and municipal uses, as well as unaccounted-for water use. Unaccounted-for water includes unmetered water, leakage, fire hydrant use, street washing, and distribution system flushing.

Step 7: 1980-1985 Average Annual Gallons Per Capita Per Day (GPCD) (Part 1)

Gallons per Capita per Day (GPCD) for a community was obtained by dividing the ADD figure obtained in Step Six by the 1985 Base Service Population obtained in Step Five.

Step 8: 2020 Population Projections

Population projections were obtained from the regional planning agencies (RPA) covering the basin. The RPA projections are based on the 1980 Federal census, analyzed in five-year increments through 2010. Population projections for the year 2020 were derived by taking the projected growth rate between 2000, 2005, 2010 and extending that projected change for the period between 2010 and 2020. The MAPC publication, Interim Population Forecast 1980-2010, January 1982, explains the agency's projection methodology and contains detailed explanatory charts and tables. All communities located in the Charles basin are included in the MAPC area.

Step 9: 2020 Minimum Service Population

This figure is the service population that would occur in 2020 assuming no growth in the area served and no increase in the seasonal population. This figure was obtained by multiplying the 1985 percent service population by the 2020 population projection and adding seasonal and out-of-town customers.

Step 10: 2020 Base Average Day Demand

The 2020 base average day demand is the estimated minimum average day demand on the community's central water supply system. This figure assumes no change in the present water use pattern except for the projected community population growth or decline.

Step 11: 2020 Increase in Percent Service Population

It is assumed that in communities where the service population is less than 100 percent of its census population, the percent of people served will increase during the planning period. The estimates of service area growth were developed from discussions with local water supply system managers and from historical experience with service area development in response to, or in anticipation of, population growth within a community. For planning purposes, it is assumed that:

--Those communities with a 100 percent service population in 1985 will remain at 100 percent throughout the planning period.

--Those communities with a 1985 service population of 90 percent or more will increase 5 percent per decade with all reaching 100 percent by 2010. It is assumed that the 1985 service population will remain the same until 1990.

--Those communities with a service population of less than 90 percent are adjusted individually, based on estimates of service area growth to 1990, as reported by the water system managers, and then increased by 10 percent per decade until 2020.

In some cases, percentage increase was adjusted at a different rate, as suggested by interviews with water superintendents and other local sources.

Step 12: 2020 Preliminary Adjusted Service Population (Part 1)

This figure represents the estimated service population if the anticipated service area increase occurs. The figure is obtained by multiplying the 2020 percent service population by the 2020 population projection and adding the 1985 seasonal population factor and any out-of-town customers.

Step 13: Local Population Refinements

Frequently, local planning departments have prepared their own population projections based on detailed analyses of the dynamics occurring within their community. These planning departments are asked to compare their figures with the population projections prepared by the RPA. If, after the review, the planning department feels that their projections are more accurate and DWR concurs, these figures are used.

Step 14: 2020 Adjusted Service Population (Part 2)

This figure is the 2020 service population adjusted to reflect local planning department input to the population projections. This figure is obtained by multiplying the 2020 increase in percent service population by the local 2020 population projections and then adding the seasonal population factor where applicable, and any out-of-town customers.

Step 15: 2020 Average Annual Gallons Per Capita Per Day (GPCD) (Part 2)

It is assumed that GPCD will remain fairly constant until 1990. After this time, GPCD will begin to rise slightly. Also, as residential growth, and commercial and industrial expansion rise in the future, GPCD will increase. This assumes minimum conservation. These factors will cause GPCD to rise incrementally from the year 1990 to 2020, resulting in an increase of 15 percent (5 percent per decade) by 2020 for each community. Therefore, the 2020 GPCD figure is obtained by multiplying the 1980-1985 GPCD by 1.15 (15 percent).

Step 16: Preliminary Adjusted 2020 ADD

This figure is the base 2020 average day demand adjusted to reflect the increased water demand resulting from service area expansion, local refinements to population projections, and an increase of the GPCD by 15 percent from 1990 to 2020. It is obtained by multiplying the 2020 GPCD by the 2020 adjusted service population.

Step 17: Significant Changes Anticipated in Water Use

This figure is a one-time adjustment to the estimated 2020 water demand from extraordinary changes to a community's water needs. Examples of this are the construction of a wastewater

recovery plant or a fish processing plant, or the permanent closing of an industry with major water use.

Step 18: Adjusted 2020 ADD

This figure is the 2020 ADD obtained in Step 16, adjusted to reflect a significant change in water use. It is obtained by adding or subtracting any significant changes to or from preliminary adjusted 2020 ADD.

Step 19: 1980-1985 Maximum Day Demand (MDD)

The 1980-1985 MDD was obtained by averaging the maximum day demand reported by the water supply system on the DEQE "Water Supply Statistics" forms for the year 1980-1985. MDD is reported in million gallons per day (mgd) and represents actual maximum water use for the water system.

Step 20: 1980-1985 MDD to ADD Ratio

This figure was calculated by dividing the 1980-1985 MDD by the 1980-1985 ADD. For planning purposes, it is assumed that this ratio will remain constant through 2020.

Step 21: 2020 Maximum Day Demand

This figure is obtained by multiplying the adjusted 2020 ADD by the 1980-1985 MDD/ADD ratio.

Step 22: 2020 Demand for Planning Purposes

The 2020 demand for planning purposes was determined in the following manner: For communities that receive 50 percent or more of their water from surface sources, the 2020 ADD is used as the 2020 demand. Because communities which use groundwater as their principle source of supply generally lack sufficient storage capacity, the 2020 MDD is used as the 2020 demand for any community that receives 50 percent or more of their water supply from groundwater sources.

APPENDIX 3A

Process Used to Identify and Locate
Massachusetts Public Water Supply Sources

This appendix is a product of the data furnished by the local public water systems during the inventory and analysis stage of the planning process. It should be read in conjunction with Appendices 3B, a map of the water supply sources, and 3C, a table listing water supply sites and locations. The following information is provided to clarify the data on the map and table.

The base map was prepared for the Massachusetts Water Resources Study by the Soil Conservation Service (USDA) in cooperation with the Massachusetts Water Resources Commission in 1971. The base map was updated to show new river basin line configurations that were prepared by the United States Geologic Survey (USGS) in 1983.

The water supply source identifying symbols on the map show the approximate location of the sources. Where several sources are in close proximity, the symbols are grouped on the map. For example, the symbol BE 5-6 would indicate that two wells belonging to the Bellingham Water Department in Bellingham are located close together near the symbol on the map.

Water Supply Agency: The water supply agency which operates the source.

Name of Source: Lists the individual water source(s) located in the community.

1985 Status of Source: Indicates whether the source was utilized every month of the year, seasonally (i.e. January - March), or not used the whole year due to contamination or its status as an emergency source.

Basin Location of Source: This column shows the river basin in which the water supply source is physically located.

Community Location of Source: This column shows the city or town in which the water supply source is physically located.

Pumping Capacity of Source: The pumping capacity in mgd is listed for the sources as reported by local water agencies based on written correspondence and telephone conversations. Pumping

capacity of a source is the maximum amount of water in mgd that can be pumped into the distribution system and/or from river to reservoir or reservoir to reservoir for each source.

1985 Average Day Demand of Source: This number is the total water pumped from a source, in calendar year 1985, divided by 365 days. If a specific source is not pumped directly to a community's distribution system, as in the case of river water or a reservoir being pumped to another reservoir, its average day demand is not included in the column. Only sources that are pumped directly to the distribution system are included in the column so that the aggregate demand of each source will equal the total 1985 average day demand for the water supply agency.

DEQE No.: The DEQE number identifies the water source according to a system designed by the Department of Environmental Quality Engineering. The numbers convey, in a standard sequence, the town in which the supply source is located (not necessarily the town it serves), the site number, and a letter identifying the status of the water supply.

Town Number: All cities and towns in Massachusetts are arranged alphabetically and numbered consecutively 001 (Abington) through 351 (Yarmouth). This number indicates the town in which that water supply is located, not necessarily the town it serves.

Site Number: Each water supply source was consecutively issued a three digit number: 001, 002, 003, etc. Depending on the source of verification for the number, the first of the three digits is either 2 or 3: 200 if verified by USGS or by both the town and USGS, 300 if verified by the town alone. An example of the chronologic pattern (hypothetical) is: 301, 302, 303, 304, etc.

Letter Identifier (Status): A letter identifier is shown below, terminates the number for a water supply source.

A - Active well
B - Active reservoir
C - Reserve well
D - Reserve reservoir
E - Well not in use
F - Abandoned reservoir
G - Status unknown (all unverified wells are 000G)
H - Contaminated well
I - MDC active reservoir
J - MDC reserve or abandoned well

K - MDC reserve or abandoned reservoir
L - MDC status unknown
M - Spring (all springs are 000M)
N - MDC contaminated well
P - Properly abandoned well

Longitude and Latitude of Source: The longitude and latitude numbers are usually given for each individual source, except when two or more sources are in very close proximity. Using these numbers, sources can be located on the USGS 7 1/2 minute series topographic maps of the state.

DWR Map Symbol of Source: Identifies the water supply agency on the accompanying map. For example: "BE-1" indicates the following:

BE: The town (Bellingham) served by the water supply agency that owns the source in question.

1: The number assigned to each individual source, either a well, wellfield or reservoir.

APPENDIX 3B

Charles River Basin
WATER SUPPLY SOURCES

▲ Ground water supply

● Surface water supply

P-2 DWR Map symbol

Water Supply Agency Symbols

BE	Bellingham Water Department	H	Holliston Water Department
C	Cambridge Water Department	L	Lincoln Water Department
DW	Dedham/Westwood Water District	MF	Medfield Streets, Water & Sewer
Da	Dover Water Company	MW	Medway Water Department
Db	Dover Water Department	ML	Milford Water Company
Dc	Dover Water Works	M	Millis DPW
Dd	Meadowbrook Water Trust	NA	Natick Water Department
De	McNamara Water Works	ND	Needham DPW
Df	Octagon Realty Trust	NO	Norfolk Water Department
Dg	Bedell Water Trust	WE	Wellesley DPW
F	Franklin DPW	W	Wrentham Water Department

Prepared by DEM, Division of Water Resources

APPENDIX 3C
PUBLIC WATER SUPPLY SITES AND LOCATIONS

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
Bellingham Water Dept.	Taunton St. Well #5	Used all year	Charles	Bellingham	0.18	0.14	41A-025-304A	42 06 09 71 29 04	BE 1
	Maple St. Ext. Well #8	Used June-Dec. Fe & Mg Problems	Charles	Bellingham	0.75	0.12	41A-025-200A	42 07 26 71 27 48	BE 2
	Maple St. Ext. Well #7	Used July-Sept. Fe & Mg Problems	Charles	Bellingham	0.33	0.03	41A-025-201A	42 07 24 71 27 58	BE 3
	Wrentham Rd. Well #4	Used all year	Blackstone	Bellingham	0.52	0.50	41A-025-309A	42 01 42 71 28 46	BE 4
	Cross St. Well #1	Used all year	Blackstone	Bellingham	0.22	0.22	41A-025-207A	42 03 16 71 27 58	BE 5
	Cross St. Well #2	Used all year	Blackstone	Bellingham	0.22	0.13	41A-025-308A	42 03 17 71 28 02	BE 6
	Wrentham Rd. Well #3	Used all year	Blackstone	Bellingham	0.32	0.11	41A-025-310A	42 01 39 71 28 53	BE 7
Boston Water and Sewer Commission	MWRA	fully supplied	Chicopee Nashua	-		119.26			
Brookline DPW	MWRA	fully supplied	Chicopee Nashua	-		7.37			

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
Cambridge Water Dept.	Hobbs Brook	Used all year	Charles	Waltham Lincoln Lexington			N/A		C 1
	Stony Brook Reservoir	Used all year	Charles	Waltham Weston	System Total 30 mgd	Combined 15.06	N/A		C 2
	Fresh Pond	Used all year	Mystic	Cambridge			31A-049-300B		C 3
	MWRA					0.53			
Dedham-Westwood Water District	Bridge St. Wellfield	Used all year	Charles	Dedham	2.00	1.13	31A-073-200A	42 15 13 71 10 53	DW 1
	Rock Meadow Well #11	Used by Westwood	Charles	Westwood	0.80	0.72	31A-335-203	42 13 50 71 13 35	DW 2
	White Lodge Well #2	Used all year	Neponset	Westwood	1.20	1.19	31A-353-308	42 12 13 71 09 04	DW 3
	White Lodge Well #1	Used all year except during Sept.	Neponset	Westwood	1.20	0.72	31A-335-306	42 12 24 71 09 06	DW 4
Dover Water Company	Chickering Dr. Well		Charles	Dover	0.02	N/A	31A-078-302A	42 15 27 71 17 09	Da 1
	Knollwood Dr. Well		Charles	Dover	0.02	N/A	31A-078-312A	42 14 20 71 13 03	Da 2
	Walpole St. Well		Neponset	Dover	0.08	N/A	31A-078-207A	42 13 17 71 16 10	Da 3
						0.06			

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
Dover Water Department	Church St. Wellfield	Used all year	Charles	Dover	0.06	0.01	31A-078-200A	42 14 54 71 17 12	Db 1
Dover Water Works	Abbe Road Well	Used all year	Charles	Dover	0.01	0.001	31A-078-206A		Dc 1
Meadowbrook Water Trust	Wellfield	Used all year	Charles	Dover	0.02	0.01	31A-078-309A 31A-078-310A 31A-078-311A	42 15 58 71 18 14	Dd 1
McNamara Water Works	Well	Used all year	Charles	Dover	0.01	0.002	N/A		De 1
Octagon Realty Trust	Comisky St. Well	Used all year	Charles	Dover	0.01	0.002	N/A		Df 1
Bedell Water Trust	Whiting Rd. Well	Used all year	Charles	Dover	0.01	0.002	N/A		Dg 1
Glen Ridge Water System	Natick Water Dept.	Used all year	Concord	Natick	0.02	0.02	N/A		
Franklin DPW	Miller St. Well #4	Used all year	Charles	Franklin	1.00	0.69	41A-101-204A	42 04 38 71 25 03	F 1
	Beaver Pond Wells #1&#2	Used Jan.-Aug.	Charles	Franklin	0.73	0.29	41A-101-303 41A-101-302A	42 04 37 71 24 59 42 04 40 71 25 02	F 2-3
	Miller St. Well #5	Used all year	Charles	Franklin	0.50	0.29	41A-101-205A	42 04 34 71 24 58	F 4

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
	Grove St. Well #3	Used all year	Charles	Franklin	0.46	0.27	41A-101-207A	42 03 36 71 25 39	F 5
	Grove St. Well #6	Used May-Dec.	Charles	Franklin	0.71	0.25	41A-101-306A	42 03 49 71 25 28	F 6
	Pond St.	Used all year	Charles	Franklin	0.65	0.24	N/A		F 7
Holliston Water Dept.	Central St. Well #5	Used all year	Charles	Holliston	0.79	0.42	21A-136-301A	42 11 50 71 23 45	H 1
	Brook St. Well #6	Used all year	Charles	Holliston	0.86	0.36	N/A	N/A	H 2
	Lake Winthrop Well #1	Used Feb.-Nov.	Charles	Holliston	0.32	0.14	21A-136-203A	42 11 18 71 25 12	H 3
	Maple St. Well #2	Used Jan.-Feb. & Jun.-Nov.	Charles	Holliston	0.36	0.09	21A-136-200A	42 13 36 71 26 25	H 4
	Washington St. Well #3	Not used in '85 Fe problems Emergency Source	Charles	Holliston	0.27	-0-	21A-136-206A	42 10 32 71 28 11	H 5
	Washington St. Well #4	Not used in '85 Fe problems Emergency Source	Charles	Holliston	0.78	-0-	21A-136-205A	42 10 36 71 28 12	H 6
Lincoln Water Dept.	Tower Road Well	Used Jan.-Nov.	Charles	Lincoln	0.72	0.11	31A-157-304A	42 24 50 71 18 53	L 1

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
	Sandy Pond	Used Aug. & Oct. thru Dec.	Charles	Lincoln	1.62	0.07	31A-157-302B	42 25 40 71 18 53	L 2
	Farrar Pond Well	Used Jan.-Oct.	Concord	Lincoln	1.01	0.21			L 3
Medfield Sts. Water & Sewer Dept.	Rte. 109 Wells 1&2	Used June-Sept. & Nov.	Charles	Medfield	1.29	0.12	31A-175-203A 31A-175-204A	42 10 56 71 19 17	MF 1
								42 10 54 71 19 22	MF 2
	Elm St. Well #3	Used all year	Neponset	Medfield	1.29	0.68	31A-175-305A	42 10 14 71 17 00	MF 3
	Elm St. Well #4	Used all year	Neponset	Medfield	0.86	0.31	31A-175-206A	42 10 10 71 16 56	MF 4
Medway Water Dept.	Village St. Well #3	Used all year	Charles	Medway	0.58	0.51	21A-177-302A	42 08 08 71 23 01	MW 1
	Water St. Well #1	Not used in Mar. & Apr.	Charles	Medway	0.72	0.14	21A-177-201A	42 08 08 71 23 15	MW 2
	Oakland St. Well #2	Used Feb.-Sept.	Charles	Medway	0.65	0.07	21A-177-200A	42 08 51 71 23 27	MW 3
Milford Water Co.	Echo Lake	Not used in Mar. & Apr.	Charles	Hopkinton	2.50	1.23	21A-139-302B		ML 1
	Charles River	Not used July-Oct.	Charles	Milford	2.50	0.70	N/A		ML 2

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
	Clarks Island Well	Not used in Jan.	Charles	Milford	1.01	0.59	21A-185-202A	42 09 14 71 30 56	ML 3
	Godfrey Brook Wells	Used all year	Charles	Milford	1.01	0.51	N/A	N/A	ML 4
	Dilla St. Wells	Used Feb., May & July-Nov.	Charles	Milford	0.50	0.08	21A-185-200A	42 09 39 71 30 48	ML 5
Millis DPW	Birch St. Well #3	Used all year	Charles	Millis	0.66	0.54	31A-187-303A	42 10 02 71 20 22	M 1
	South End Pond Well #4	On line Dec. 31, 1985	Charles	Millis	0.86	-0-	New	New	M 2
Natick Water Dept.	Pine Oak Wellfield	Used July-Dec.	Charles	Natick	2.02	0.21	31A-198-203A 31A-198-204A 31A-198-205A	42 18 42 71 20 40 42 18 38 71 20 41 42 18 35 71 20 37	NA 1
	Morse Pond Wellfield	Not used in 1985 low ph. required construction of a treatment plant	Charles		0.29	-0-	31A-198-206C	42 17 46 71 19 32	NA 2
	Evergreen Well #2	Used all year	Concord	Natick	2.53	1.54	31A-198-300A	42 18 31 71 22 19	NA 3

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
	Evergreen Well #1	Used all year	Concord	Natick	1.73	1.18		42 18 30 71 22 20	NA 4
	Springvale Well #3	Used all year	Concord	Natick	1.37	1.15	31A-198-301A	42 17 54 71 22 07	NA 5
	Springvale Well #4	Not used in Mar. & Oct.-Dec.	Concord	Natick	1.41	0.17	31A-198-302A	42 17 54 71 22 11	NA 6
	Springvale Wells #1&#2	Not used Jan.-Mar.	Concord	Natick	1.15	0.09	31A-198-302A	42 17 54 71 22 09	NA 7
								42 17 54 71 22 10	NA 8
	Springvale Well #5	Used Jan.-July	Concord	Natick	0.29	0.06	31A-198-302A	N/A	NA 9
Needham DPW Water Div.	Charles River St. Well #3	Used all year	Charles	Needham	1.72	1.65	31A-199-02G	42 16 00 71 17 53	ND 1
	Charles River St. Well #2	Used all year	Charles	Needham	2.16	1.43	31A-199-01G	42 16 05 71 17 53	ND 2
	Charles River St. Well #5	Emergency	Charles	Needham	1.00	-0-	31A-199-03G	42 15 57 71 17 54	ND 3
	MWRA	Used all year	Chicopee Nashua	-	up to 12.5	0.51			

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
Newton Water Dept.	MWRA	fully supplied	Chicopee Nashua	-		10.10			
Norfolk Water Dept.	Gold St. Well	Used all year	Charles	Norfolk	0.50	0.17	31A-208-304A	42 07 44 71 21 18	NO 1
Waltham DPW Water Div.	MWRA	Used all year	Chicopee Nashua	-		8.92			
Watertown DPW	MWRA	Used all year	Chicopee Nashua	-		3.43			
Wellesley DPW Water & Sewer	Morses Pond Wells #1&#2	Used all year	Charles	Wellesley	2.02	0.94	31A-317-03G	42 17 52 71 19 00	WE 1
	Wellesley Ave. Wells #1 & #2	Used all year	Charles	Wellesley	1.30	0.75	31A-317-02G	42 18 09 71 15 15 42 18 11 71 15 11	WE 2
	Rosemary Well	Used all year	Charles	Wellesley	0.60	0.34	31A-317-04G	N/A	WE 3
	T.F. Coughlin Well	Used all year	Charles	Wellesley	0.86	0.33	31A-317-06G	42 18 12 71 15 08	WE 4
	Longfellow Pond Well	Used all year	Charles	Wellesley	0.40	0.21	31A-317-05G	42 18 48 71 15 15	WE 5
	MWRA Contract	Not Used	Chicopee/ Nashua	-	7.50	-	-	---	-
Weston Water Dept.	MWRA	fully supplied	Chicopee/ Nashua	-	1.16	-	-		WS 1

PUBLIC WATER SUPPLY SITES AND LOCATIONS (CONTINUED)

WATER SUPPLY AGENCY	NAME OF SOURCE	1985 STATUS OF SOURCE	BASIN LOCATION OF SOURCE	COMMUNITY LOCATION OF SOURCE	1985 PUMPING CAPACITY OF SOURCE (mgd)	1985 AVG. DAY DEMAND OF SOURCE (mgd)	DEQE # OF SOURCE	LATITUDE & LONGITUDE OF SOURCE	DWR MAP SYMBOL OF SOURCE
Wrentham Dept. of Public Works	Lake Pearl Well #3	Used all year	Charles	Wrentham	0.72	0.35	41A-350-204A	42 04 23 71 21 16	W 1
	Lake Pearl Well #2	Not used in Mar. & Apr.	Charles	Wrentham	0.72	0.21	41A-350-203A	42 04 22 71 21 03	W 2
	Thurston St. Well #4	Used all year	Taunton	Wrentham	0.86	0.37	41A-350-201A	42 03 26 71 18 04	W 3

APPENDIX 4A

Self - Supplied Residential Water Use - 1985

On-site self-supplied residential wells account for a small portion of the domestic water supply needs of the people living in the Charles River basin.

In 1985, two percent (21,643) of the people living in the basin obtained their water supply from on-site residential wells. The 1985 estimated average day demand from these wells was approximately 1.72 mgd, or one percent of the average day demand of the public water supply systems in the basin in 1985 (See table below).

Some portions of 14 communities are self-supplied, and the residents of the Town of Sherborn meet their water supply needs entirely through on-site self-supplied wells.

Charles River Basin

Self-Supplied Residential Water Use (1985)

(MGD)

Community	1985 Self-Supplied Population	Water Use at 79 Gallons per Capita Day	Percent of Town Area within the Charles Basin	Est. Self Supplied water use in Charles Basin
Bellingham	373	.03	52%	.02
Dover	3,344	.27	85	.23
Franklin	1,072	.09	90	.08
Holliston	1,261	.10	98	.10
Lincoln	1,518	.12	60	.07
Medfield	103	.01	77	.01
Medway	361	.03	100	.03
Milford	481	.04	86	.03
Millis	334	.03	100	.03
Norfolk	4,844	.38	99	.38
Sherborn	4,350	.34	82	.28
Wellesley	1,894	.15	100	.15
Westwood	263	.02	33	.01
Wrentham	1,445	.11	43	.05
TOTAL	21,643	1.72 mgd		1.47 mgd

Source of Data

DWR's methodology used to estimate the amount of water used for domestic purposes by residents with individual on-site wells within the hydrologic boundaries of the Charles River basin are described below.

Methodology

Step 1: Approximate the number of self-supplied residents within the study area communities.

In the 1985 Water Resources Management Plan - Phase II questionnaire, each water supply agency manager reported the agency's service population as a portion of the 1985 state census for the community served. For this report, however, the number of self-supplied residents was estimated by subtracting the 1985 service population from the 1985 state census figures. For example, 90% of the population of Holliston (11,345 out of 12,606) is served by the Holliston Water Department. The remaining 1,261 (10%) are self-supplied. The Phase II plan was updated by personal field visits and telephone calls to the communities.

Step 2: Determine self-supplied water use

The 1985 self-supplied residential water use was estimated by multiplying the community's self-supplied population by 79 gallons per capita day (gpcd). The gpcd factor was taken from the "Estimated Use of Water in the U.S. in 1980" prepared by the U.S. Geological Survey. The 79 gpcd figure was used to estimate rural self-supplied use and was verified for Massachusetts in a study of water supply systems in the Parker River basin, an essentially rural area.

Step 3: Determine amount of self-supplied residential water withdrawn from Charles River basin.

For those communities whose land area lies entirely within the Charles River basin boundaries, it can be assumed that all self-supplied water is withdrawn from the basin. However, this assumption does not hold for communities lying partially in the basin. In these instances, the water withdrawn from the basin was calculated based on the percentage of the land area of the town that lies within the Charles basin. For example, the Town of Sherborn lies within two basins: the Charles and the Concord. Of the town's total 16.14 square miles, 82 percent or 13.23 square miles lies within the Charles River basin. Therefore, Sherborn's self-supplied residential water withdrawal from the Charles can be calculated by multiplying the percent of the town in the basin (82%) by the total self-supplied residential water use.

(82% X 0.34 mgd = 0.28 mgd from Charles basin)

APPENDIX 4B

Self-Supplied Non-Residential Water Use - 1985

On-site self-supplied non-residential wells account for a significant portion of the overall water supply needs of the people living and/or working in the Charles River basin basin.

The 1985 estimated average day demand from on-site non-residential wells was approximately 56.85 mgd, or 29 percent of the average day demand of the public water supply systems in the basin in 1985 (See table below). Ninety-three percent of this water was used by the Cambridge Electric Company in Cambridge. Almost all of the total 56.85 mgd from this category of water use was returned to the basin after use. The following data were collected from Water Management Act registration forms submitted to the DEQE Division of Water Supply in late 1987 and early 1988.

Self-Supplied Non-Residential Water Use (1985)

Community	Institution	ADD(mgd)	
Belmont	Belmont Country Club	0.07	
Brookline	The Country Club	0.43	
Cambridge	Cambridge Electric Co.	52.82	
Cambridge	Massachusetts Institute of Technology	0.60	
Franklin	Franklin Country Club	0.11	
Medfield	Medfield State Hospital	0.10	
Medway	Ben Genarazio	0.24	
Millis	Huna Rosenfeld	0.12	
Millis	Tresca Bros. Sand and Gravel	0.37	
Newton	Charles River Country Club	0.02	
Newton	Woodland Golf Club	0.16	
Norfolk	Mass. Corr. Institution (Norfolk/Walpole)	0.45	
Norfolk	Southwood Community Hospital	0.05	
Somerville	Ames Safety Envelope Co.	0.14	
Wellesley	Wellesley College	0.50	
Wellesley	Wellesley Country Club	0.23	
Weston	Campion Center	0.10	
Weston	Weston Golf Club	0.09	
Wrentham	Wrentham State School	0.25	
TOTAL		56.85	MGD

APPENDIX 5

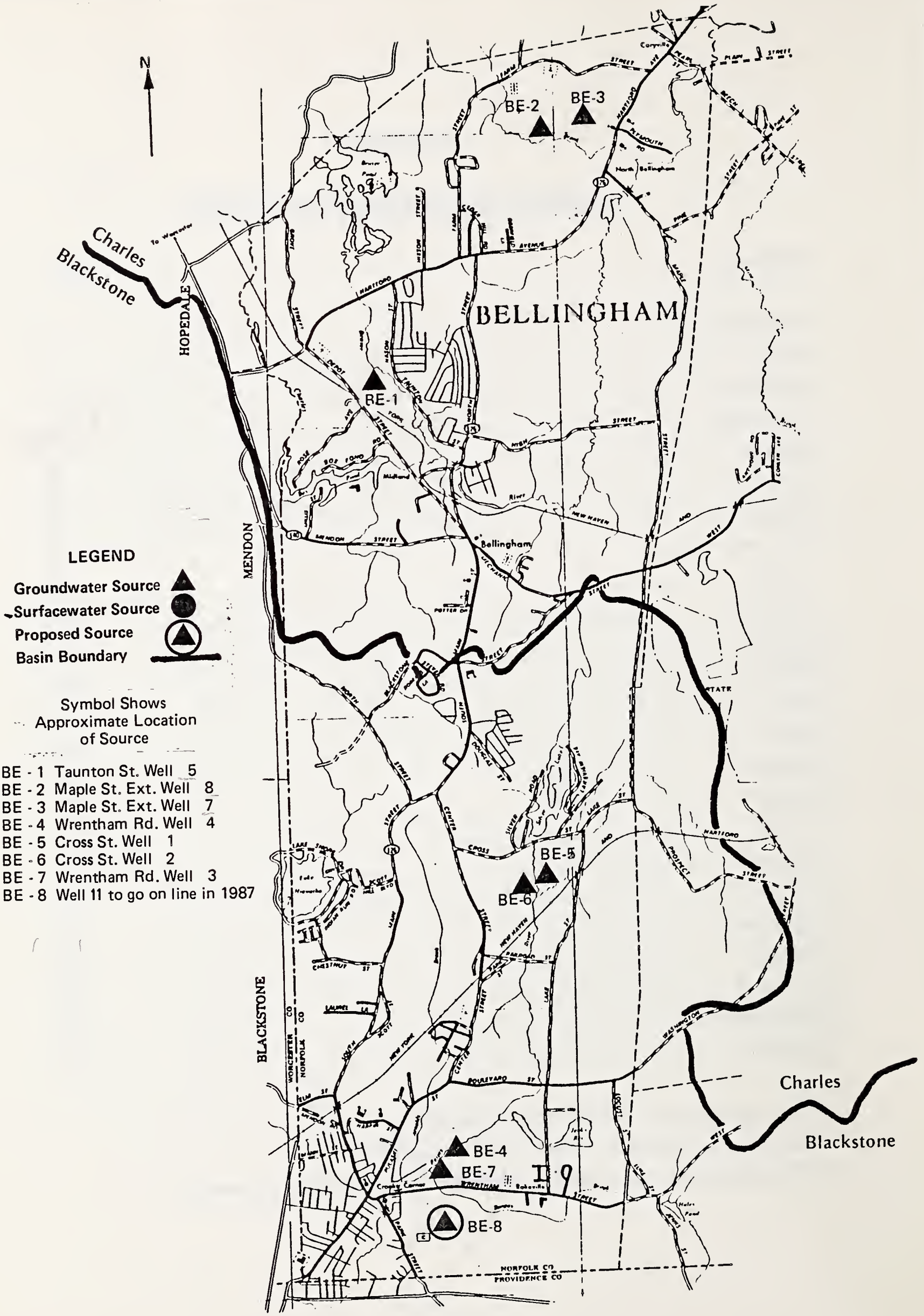
Community Public Water Supply Facts and Maps

Community	PAGE
Bellingham	76
Boston *	79
Brookline*	81
Cambridge	83
Dedham	86
Dover	89
Franklin	92
Holliston	95
Lincoln	98
Medfield	101
Medway	104
Milford	107
Millis	110
Natick	113
Needham	116
Newton*	119
Norfolk	121
Sherborn**	124
Waltham *	126
Watertown*	128
Wellesley	130
Weston *	133
Westwood***	135
Wrentham	137

* Fully-supplied by the MWRA (map not included)

**Town has no public water supply (map not included)

***See Dedham for map of Dedham/Westwood Water District supply sources



BE - 1 Taunton St. Well 5
BE - 2 Maple St. Ext. Well 8
BE - 3 Maple St. Ext. Well 7
BE - 4 Wrentham Rd. Well 4
BE - 5 Cross St. Well 1
BE - 6 Cross St. Well 2
BE - 7 Wrentham Rd. Well 3
BE - 8 Well 11 to go on line in 1987

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Bellingham **WATER SUPPLY AGENCY:** Bellingham Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
13,967	14,300	13,677	15,830	18,310	20,000	21,690

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
13,677	18.91	723

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
13,267	97%	410	3%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.03	1.08	1.16	1.13	1.15	1.26	1.14

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.23	1.95	2.46	2.04	1.84	2.22	2.12

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.26	88.9	91.3	92.1	102.4	119.1	104.8	115.9	107.9	95.2	92.1	92.1	91.3%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
1.32	1.60	2.15

Maximum Day Demand (mgd)

1990	2000	2020
2.45	2.98	3.99

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
2.12 (mgd)	3.99 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Bellingham WATER SUPPLY AGENCY: Bellingham Water Department

River Basin Acreage Distribution:

Charles	Blackstone
6,302 (52%)	5,802 (48%)

Total Acreage:

12,104 acres (18.91 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Taunton St. Well # 5	Charles	0.18	0.14	BE-1	Used all year
Maple St. Ext. Well # 8	Charles	0.75	0.12	BE-2	Used May-Nov Fe & Mg Problems
Maple St. Ext. Well # 7	Charles	0.33	0.03	BE-3	Used July-Sept. Fe & Mg Problems
Wrentham Rd. Well # 4	Blackstone	0.52	0.50	BE-4	Used all year
Cross Street Well # 1	Blackstone	0.22	0.23	BE-5	Used all year
Cross Street Well # 2	Blackstone	0.22	0.13	BE-6	Used all year
Wrentham Rd. Well # 3	Blackstone	0.32	0.11	BE-7	Used all year
Well # 11	Blackstone	N/A	N/A	BE-8	To go on line in 1987

TOTAL: 1985 ADD 1.26

TOTAL: 1985 ADD on River Basin

Charles	0.29
Blackstone	0.97

Wastewater Discharge:

100 percent of Bellingham's population discharges their wastewater via individual on-site septic disposal fields.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Boston **WATER SUPPLY AGENCY:** Boston Water & Sewer Commission

Population:

1970 U.S. Census	1980 U.S. Census	1985 Census	1990 Projected Population	2000 Projected Population	2010 Projected Population	2020 Projected Population
641,071	562,994	571,000	576,000	587,000	600,000	615,000

1985, 1990, 2000 & 2020 population from Boston Water & Sewer Commission. 2020 projection is a straightline continuation of 2010.

Population Density:

1985 Census	Area of Community (in square miles) *	1985 Population Density (persons per square miles)
571,000	50.55	11,296

* Soil Conservation Service

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
571,000	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
135.24	131.99	128.59	125.31	117.32	119.26	126.29

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
223.80	184.45	192.07	184.72	178.08	179.80	190.49

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
119.26	96.5	95.0	94.4	92.2	95.8	103.2	168.7	107.5	105.3	101.5	99.4	99.9%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
127.40	136.32	155.92

Maximum Day Demand (mgd)

1990	2000	2020
192.16	205.62	235.18

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
126.29 (mgd)	155.92 (mgd)

Public Water Supply Sources - Boston Water and Sewer Commission

1. Basin Acreage Distribution

River Basin Acreage

City of Boston

Charles	Neponset	Boston Harbor (Mystic)	Total Acreage
21,733 (67%)	6,226 (19%)	4,395 (14%)	32,354 acres (50.55 sq. miles)

2. Sources of Public Water Supply

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua	-	119.26	-	

TOTAL: 1985 ADD 119.26

3. TOTAL: 1985 ADD on Basin

Charles	0.00
Chicopee/Nashua	119.26

4. Wastewater Discharge

100 percent of the population of the City of Boston utilizes the MWRA wastewater treatment facilities at Deer Island and Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin, (Basin # 28). The average daily discharge in 1985 was 119 mgd.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Brookline

WATER SUPPLY AGENCY: Brookline Department of Public Works
Water Division

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
58,689	55,062	58,152	54,300	53,500	53,000	53,100

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
58,152	6.80	8,552

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
58,152	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
7.15	7.04	6.70	6.99	6.78	7.37	7.01

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
12.69	11.76	10.95	14.23	13.65	14.01	12.88

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
7.37	84.3	84.6	88.2	103.4	109.7	117.7	111.9	106.1	102.1	98.7	97.2	95.0%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
6.55	6.77	7.36	12.03	12.44	13.53

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
7.01 (mgd)	7.36 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Brookline WATER SUPPLY AGENCY: Brookline DPW, Water Division

River Basin Acreage Distribution:

Charles
4,354 (100%)

Total Acreage:

4,354 acres (6.80 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		7.37		

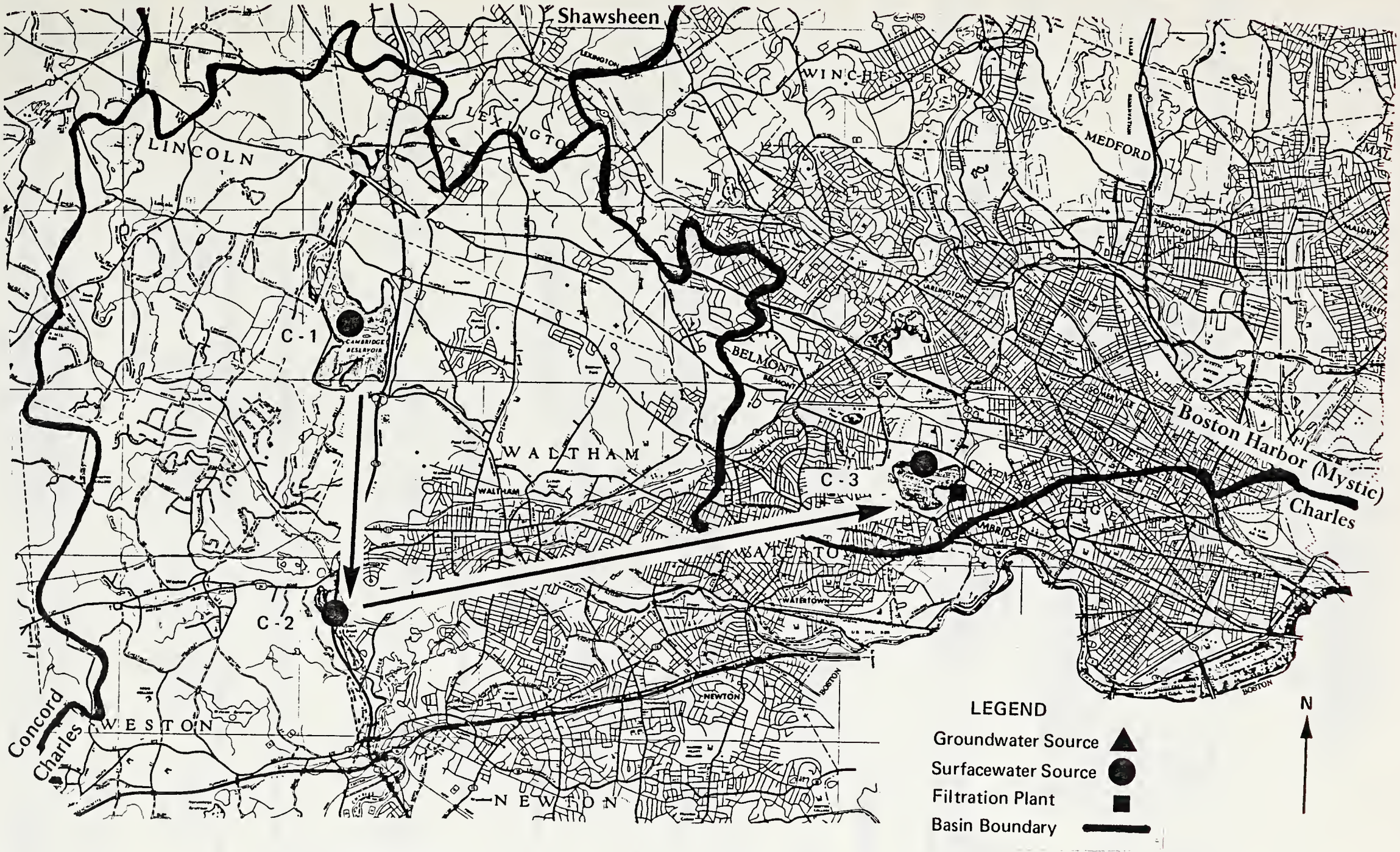
TOTAL: 1985 ADD 7.37

TOTAL: 1985 ADD on River Basin

Chicopee/ Nashua 7.37

Wastewater Discharge:

100 percent of the population of the Town of Brookline utilizes the MWRA wastewater treatment facilities at Deer Island and Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin #28). The average daily discharge in 1985 was approximately 7.37 mgd.



CAMBRIDGE

Symbol Shows Approximate Location of Source

C - 1 Hobbs Brook (Cambridge Reservoir)
C - 2 Stony Brook Reservoir
C - 3 Fresh Pond (Storage)
not shown: partial supply from MWRA

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Cambridge **WATER SUPPLY AGENCY:** Cambridge Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
100,361	95,322	86,865	90,000	88,800	88,400	88,000

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
86,865	7.09	12,252

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
86,865	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
17.25	17.20	17.01	17.69	17.53	15.59	17.05

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
24.69	24.00	24.43	22.33	23.03	22.20	23.45

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
15.59	113.0	98.5	85.7	79.8	100.5	87.9	106.4	110.3	106.6	107.9	101.0	101.1%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
17.67	18.30	19.86	24.30	25.17	27.32

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
17.05 (mgd)	19.86 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Cambridge WATER SUPPLY AGENCY: Cambridge Water Department

River Basin Acreage Distribution:

Charles	Boston Harbor (Mystic)
2,945 (65%)	1,593 (35%)

Total Acreage:

4,538 acres (7.09 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Hobbs Brook	Charles			C-1	Used all year
Stony Brook Reservoir	Charles	system Total 30 mgd	combined 15.06	C-2	Used all year
Fresh Pond	Mystic*			C-3	Used all Year
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		0.53		

* Fresh Pond is used for storage only so we do not include it as a Source location

TOTAL:	1985 ADD		15.59
TOTAL:	1985 ADD on	River Basin	
		Charles	15.06
		Mystic	0.00
Wastewater Discharge:		Chicopee/Nashua	0.53

100 percent of the popualtion of the City of Cambridge utilizes the MWRA wastewater treatment facility at Deer Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin # 28). The average daily discharge in 1985 was approximately 15.59 mgd.

N
NEEDHAM
DEDHAM
WESTWOOD
NORWOOD
BOSTON
MILTON
Charles
Neponset
Charles
Neponset
DW-1
DW-2
DW-3
DW-4
DW-5 & 6
LEGEND
Groundwater Source
Surfacewater Source
Filtration Plant
Basin Boundary
Symbol Shows
Approximate Location
of Sources
DW -1 Bridge Street Wellfield
DW -2 Rock Meadow Well 11
DW -3 White Lodge Well 2
DW -4 White Lodge Well 1
DW -5 White Lodge Well 3
DW -6 White Lodge Well 4

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Dedham

WATER SUPPLY AGENCY: Dedham-Westwood Water District

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
26,938	25,298	23,729	24,300	24,300	24,300	24,300

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
23,729	10.68	2,222

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
23,729	100 %	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.50	2.50	2.42	2.52	2.53	2.52	2.50

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
3.70	3.71	3.80	3.98	3.84	3.44	3.74

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2.52	98.0	93.2	93.4	100.0	107.4	108.3	108.3	102.5	98.1	97.7	94.5	100.9%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
2.56	2.69	2.94	3.83	4.02	4.40

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
3.74 (mgd)	4.40 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Dedham **WATER SUPPLY AGENCY:** Dedham-Westwood Water District

River Basin Acreage Distribution:

Charles 4,990 (73%) Neponset 1,843 (27%)

Total Acreage:

6,833 acres (10.68 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Dedham/Westwood combined Pumping Capacity of Source (mgd)	Dedham only 1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Bridge Street Wellfield	Charles	2.00	0.94	DW-1	Used all year
Rock Meadow Well # 11	Charles	0.80	0.00	DW-2	Used by Westwood only
White Lodge Well # 2	Neponset	1.20	0.98	DW-3	Used all year
White Lodge Well #1	Neponset	1.20	0.60	DW-4	Used all year Except during Sept.
White Lodge Well # 3	Neponset	N/A	0.00	DW-5	Off line in 1985. Rehabilitated in 1987 with treatment plant
White Lodge Well #4	Neponset	N/A	0.00	DW-6	Off line in 1985. Rehabilitated in 1987 with treatment plant

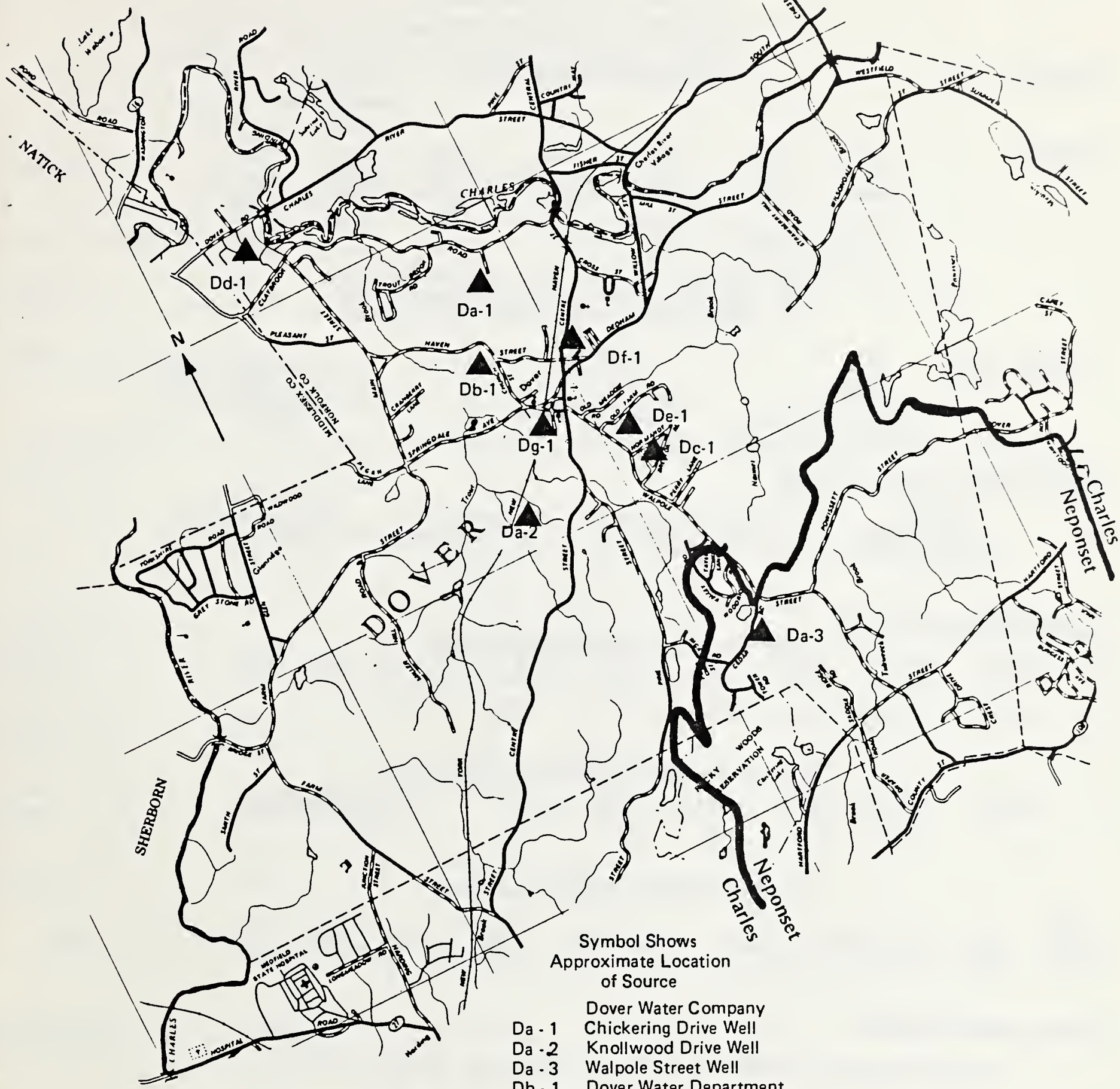
TOTAL: 1985 ADD 2.52

TOTAL: 1985 ADD on River Basin

Charles 1.24
Neponset 1.28

Wastewater Discharge:

100 percent of the population of the Town of Dedham utilizes the MWRA wastewater treatment facility at Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin #28) The average daily discharge in 1985 was approximately 2.52 mgd.



LEGEND

Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows
Approximate Location
of Source

Dover Water Company

Da - 1 Chickering Drive Well
Da - 2 Knollwood Drive Well
Da - 3 Walpole Street Well

Db - 1 Dover Water Department
Church Street Wellfield

Dc - 1 Dover Water Works
Abbe Road Well

Dd - 1 Meadowbrook Water Trust Wellfield

De - 1 McNamara Water Works Well

Df - 1 Octagon Realty Trust
Comisky Street Well

Dg - 1 Bedell Water Trust
Whiting Road Well

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Dover

WATER SUPPLY AGENCY:

Octagon Realty Trust
Bedell Water Trust
Glen Ridge Water System
Dover Water Company
Dover Water Department
Dover Water Works
Meadowbrook Water Trust
McNamara Water Works

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
4,529	4,703	4,581	4,700	4,700	4,700	4,700

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
4,581	15.46	296

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
1,237	27%	3,344	73%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.11	0.11	0.11	0.11	0.11	0.11	0.11

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.14	0.14	0.14	0.14	0.14	0.14	0.14

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.11	Not Available											

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
0.11	0.16	0.27	0.14	0.21	0.35

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)		2020 Demand for Planning Purposes (2020 projected MDD)	
0.14	(mgd)	0.35	(mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Dover

River Basin Acreage Distribution:

Charles	Neponset
8,402 (85%)	1,495 (15%)

Total Acreage:

9,897 acres (15.46 sq. miles)

Sources of Public Water Supply:

Water Supply Agency	Name of Source	Basin Location of Source	*Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Dover Water Department	Church Street Wellfield	Charles	0.06	0.01	Db-1	Used all year
Dover Water Works	Abbe Road Well	Charles	0.01	0.001	Dc-1	Used all year
Meadowbrook Water Trust	Wellfield	Charles	0.02	0.01	Dd-1	Used all year
McNamara Water Works	Well	Charles	0.01	0.002	De-1	Used all year
Octagon Realty Trust	Comisky Street Well	Charles	0.01	0.002	Df-1	Used all year
Bedell Water Trust	Whiting Road Well	Charles	0.01	0.002	Dg-1	Used all year
Dover Water Company	Chickering Dr. Well	Charles	0.02	0.01	Da-1	
	Knollwood Dr.	Charles	0.02	0.01	Da-2	
	Walpole Street	Neponset	0.08	0.04 (0.06)	Da-3	Used all year
Glen Ridge Water System	Natick Water Deparment	Concord	0.02	0.02		Used all year

TOTAL: 1985 ADD 0.11

TOTAL: 1985 ADD on River Basin

Charles	0.047
Neponset	0.04
Concord	0.02

* All of Dovers Pumping Capacities are estimates by the Division of Water Resources

Wastewater Discharge:

100 Percent of the population of the Town of Dover discharges their wastewater via individual on-site septic disposal fields.

LEGEND

Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows Approximate Location of Source

F - 1 Miller Street Well 4
F - 2 Beaver Pond Well 1
F - 3 Beaver Pond Well 2
F - 4 Miller Street Well 5
F - 5 Grove Street Well 3
F - 6 Grove Street Well 6
F - 7 Pond Street Well 7
F - 8 Populatic Well 8

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Franklin **WATER SUPPLY AGENCY:** Franklin Department of Public Works

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
17,830	18,217	17,865	22,200	27,110	29,500	31,890

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
17,865	26.98	662

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
16,793	94%	1,072	6%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.04	1.88	1.86	2.11	2.05	2.03	1.99

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.87	2.34	3.26	3.01	2.60	2.76	2.81

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2.03	92.6	95.5	94.8	103.7	94.1	106.4	119.5	106.5	95.7	102.7	92.6	97.3%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
2.47	3.34	4.35	3.49	4.72	6.14

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
2.81 (mgd)	6.14 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Franklin **WATER SUPPLY AGENCY:** Franklin DPW

River Basin Acreage Distribution:

Charles	Blackstone
15,599 (90%)	1,668 (10%)

Total Acreage:

17,267 acres (26.98sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Miller St. Well #4	Charles	1.00	0.69	F-1	Used all year
Beaver Pond Wells 1&#2	Charles	0.73	0.29	F-2&3	Used Jan - Aug
Miller St. Well #5	Charles	0.50	0.29	F-4	Used all year
Grove Street Well #3	Charles	0.46	0.27	F-5	Used all year
Grove Street Well #6	Charles	0.71	0.25	F-6	Used May - Dec
Pond Street Well #7	Charles	0.65	0.24	F-7	Used all year
Populatic St. Well #8	Charles	0.40	0.00	F-8	Well on line May 87

TOTAL: 1985 ADD 2.03

TOTAL: 1985 ADD on River Basin

Charles 2.03

Wastewater Discharge:

48 percent of the population of the Town of Franklin utilizes the Charles River Pollution Control District's (CRPCD) wastewater treatment facility to dispose of their wastewater. The treatment plant's effluent is discharged into the Charles River.

The remaining 52 percent of the towns population discharges their wastewater via individual on- site septic disposal fields.

LEGEND

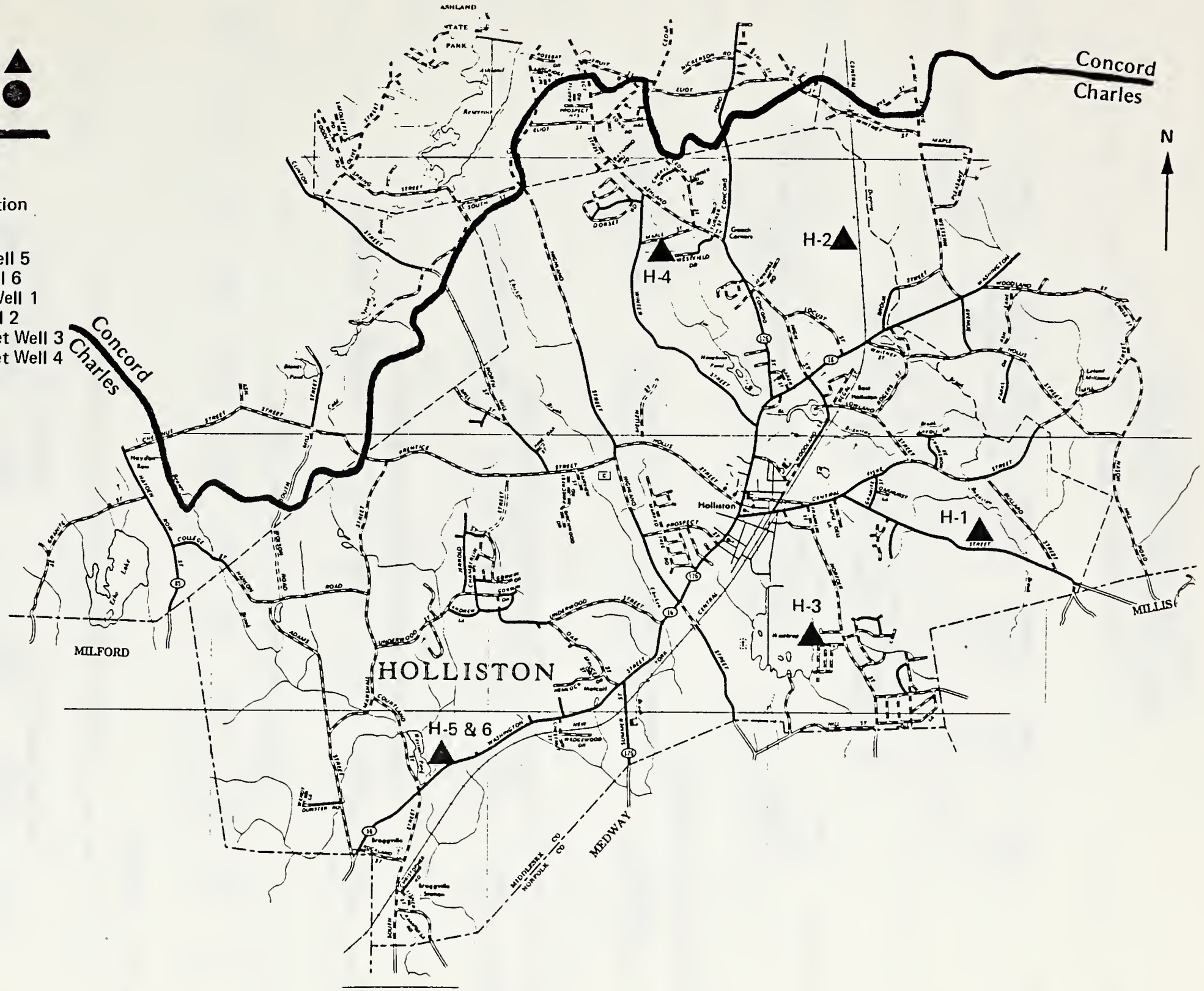
Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ▬

Symbol Shows
Approximate Location
of Source

H - 1 Central Street Well 5
H - 2 Brook Street Well 6
H - 3 Lake Winthrop Well 1
H - 4 Maple Street Well 2
H - 5 Washington Street Well 3
H - 6 Washington Street Well 4



DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Holliston **WATER SUPPLY AGENCY:** Holliston Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
12,069	12,622	12,606	13,900	14,200	14,300	14,300

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
12,606	19.06	661

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
11,345	90%	1,261	10%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.04	1.07	0.98	0.98	0.97	1.02	1.01

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.52	2.26	2.45	2.52	1.63	1.93	2.22

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.02	84.0	84.0	83.0	90.6	118.4	113.1	126.7	113.5	102.0	101.1	92.5	89.2%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
1.11	1.26	1.46

Maximum Day Demand (mgd)

1990	2000	2020
2.45	2.77	3.22

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
2.22 (mgd)	3.22 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Holliston

WATER SUPPLY AGENCY: Holliston Water Department

River Basin Acreage Distribution:

Charles	Concord (Concord & Sudbury)
11,925 (98%)	276 (2%)

Total Acreage:

12,201 acres (19.06 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Central St. Well # 5	Charles	0.79	0.42	H-1	Used all year
Brook St. Well # 6	Charles	0.86	0.36	H-2	Used all year
Lake Winthrop Well # 1	Charles	0.32	0.14	H-3	Used Feb-Nov
Maple St. Well # 2	Charles	0.36	0.09	H-4	Used Jan-Feb & Jun-Nov
Washington St. Well # 3	Charles	0.27	0.00	H-5	Fe & Mn problems Emergency Source
Washington St. Well # 4	Charles	0.78	0.00	H-6	Fe & Mn problems Emergency Source
Ashland Water Department	Concord		0.01		Purchases water from Ashland Water Dept.

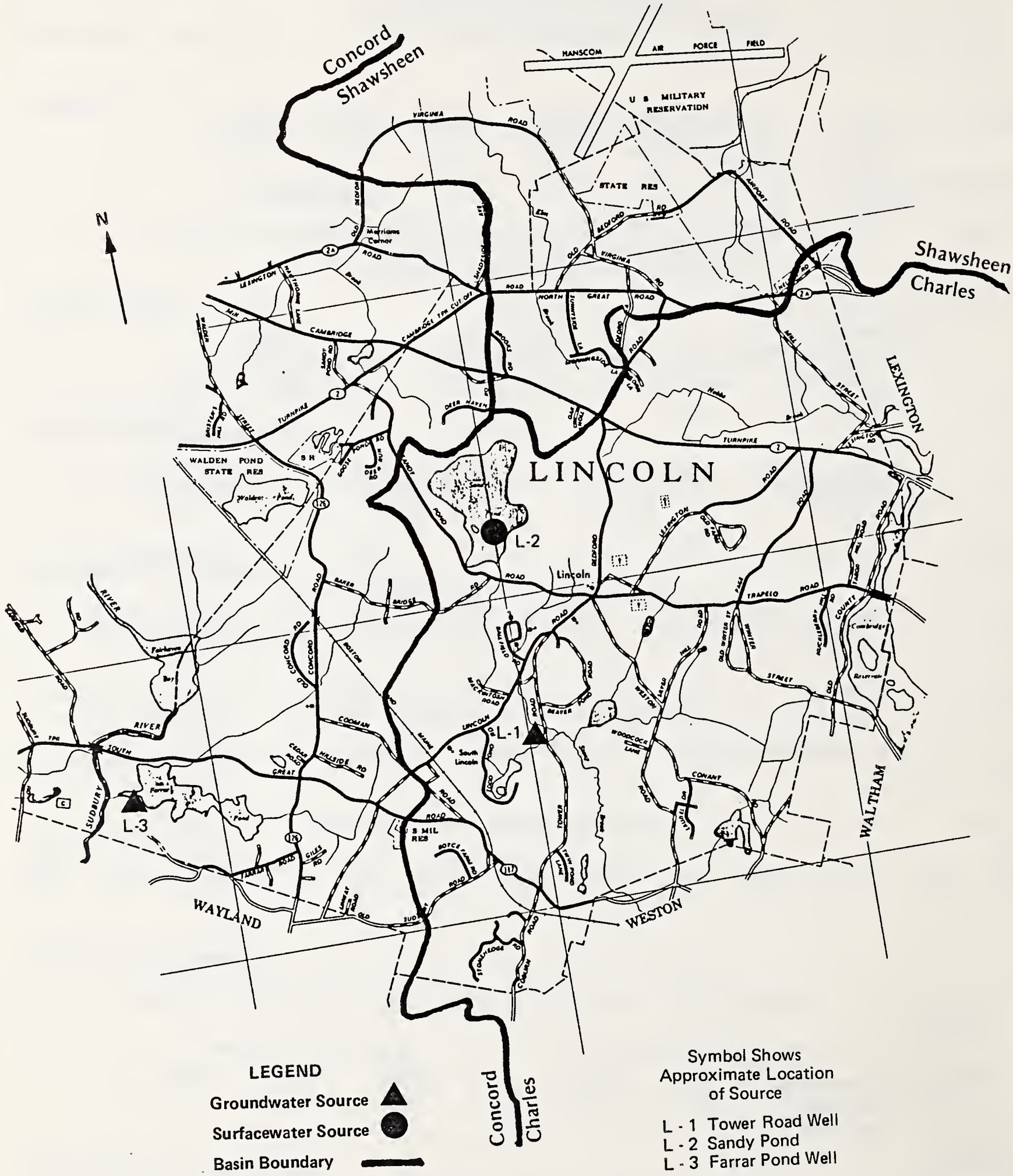
TOTAL: 1985 ADD 1.02

TOTAL: 1985 ADD on River Basin

Charles	1.01
Concord	0.01

Wastewater Discharge:

100 percent of Holliston's population discharges their wastewater via individual on-site septic disposal fields.


Concord
Shawsheen
HANSCOM AIR FORCE FIELD
U S MILITARY RESERVATION
VIRGINIA ROAD
STATE RES
BEDFORD ROAD
AIRPORT ROAD
Shawsheen
Charles
N
Merriam Corner
LEXINGTON ROAD
CAMBRIDGE TPK CUT OFF
NORTH GREAT ROAD
CAMBRIDGE TURNPIKE
LEXINGTON
WALDEN POND STATE RES
LINCOLN
L-2
L-1
L-3
Lincoln
TRAPELO ROAD
RIVER
SUDBURY
WAYLAND
WESTON
WALTHAM
Concord
Charles
LEGEND
Groundwater Source
Surfacewater Source
Basin Boundary
Symbol Shows Approximate Location of Source
L - 1 Tower Road Well
L - 2 Sandy Pond
L - 3 Farrar Pond Well

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Lincoln

WATER SUPPLY AGENCY: Lincoln Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
7,567	7,098	6,902	7,100	7,100	7,100	7,100

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
6,902	14.96	461

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
5,384	78%	1,518	22%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.58	0.42	0.31	0.50	0.45	0.39	0.44

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.05	0.66	0.87	1.17	0.68	0.58	0.84

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.39	118.4	82.1	46.1	41.5	133.5	120.0	85.8	135.9	92.3	92.2	76.1	76.9%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
0.45	0.51	0.67	0.86	0.97	1.27

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
0.84 (mgd)	1.27 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Lincoln

WATER SUPPLY AGENCY: Lincoln Water Department

River Basin Acreage Distribution:

Charles	Concord	Shawsheen
5,770 (60%)	2,584(27%)	1,220(13%)

Total Acreage:

9,574 acres (14.96 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Tower Road Well	Charles	0.72	0.11	L-1	Used Jan-Nov
Sandy Pond	Charles	1.62	0.07	L-2	Used Aug&Oct-Dec
Farrar Pond Well	Concord	1.01	0.21	L-3	Used Jan-Oct
Town of Weston (MWRA)	Chicopee/ Nashua	---	less than 0.01	--	----

TOTAL: 1985 ADD 0.39

TOTAL: 1985 ADD on River Basin

Charles	0.18
Concord	0.21

Wastewater Discharge:

100 percent of Lincoln's population discharges their wastewater via individual on-site septic disposal fields.

LEGEND

Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows Approximate Location of Source

MF - 1 Rt. 109 Well 1
MF - 2 Rt. 109 Well 2
MF - 3 Elm Street Well 3
MF - 4 Elm Street Well 4

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Medfield

WATER SUPPLY AGENCY: Medfield Street, Water and Sewer Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
9,821	10,220	10,330	11,800	12,200	12,300	12,400

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
10,330	14.64	706

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
10,227	99%	103	1%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.95	0.91	0.91	1.03	1.08	1.11	1.00

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.98	2.26	2.25	2.79	2.03	2.03	2.22

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.11	94.5	89.7	86.4	91.6	102.4	116.2	134.1	115.1	92.6	96.3	91.4	93.1%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
1.14	1.26	1.40	2.54	2.79	3.10

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
2.22 (mgd)	3.10 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Medfield **WATER SUPPLY AGENCY:** Medfield Street, Water & Sewer Department

River Basin Acreage Distribution:

Charles	Neponset
7,187 (77%)	2,183 (23%)

Total Acreage:

9,370 acres (14.64 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Rte. 109 Wells 1 & 2	Charles	1.29	0.12	MF-1	Used Jun-Sept &Nov
				MF-2	
Elm Street Well #3	Neponset	1.29	0.68	MF-3	Used all year
Elm Street Well # 4	Neponset	0.86	0.31	MF-4	Used all year

TOTAL: 1985 ADD 1.11

TOTAL: 1985 ADD on River Basin

Charles	0.12
Neponset	0.99

Wastewater Discharge:

33 percent of the population of the Town of Medfield utilizes the Charles River Pollution Control District's (CRPCD) wastewater treatment facility to dispose of their wastewater. The treatment plant's effluent is discharged into the Charles River.

The remaining 66 percent of the town's population discharge their wastewater via individual on-site septic disposal fields.

LEGEND

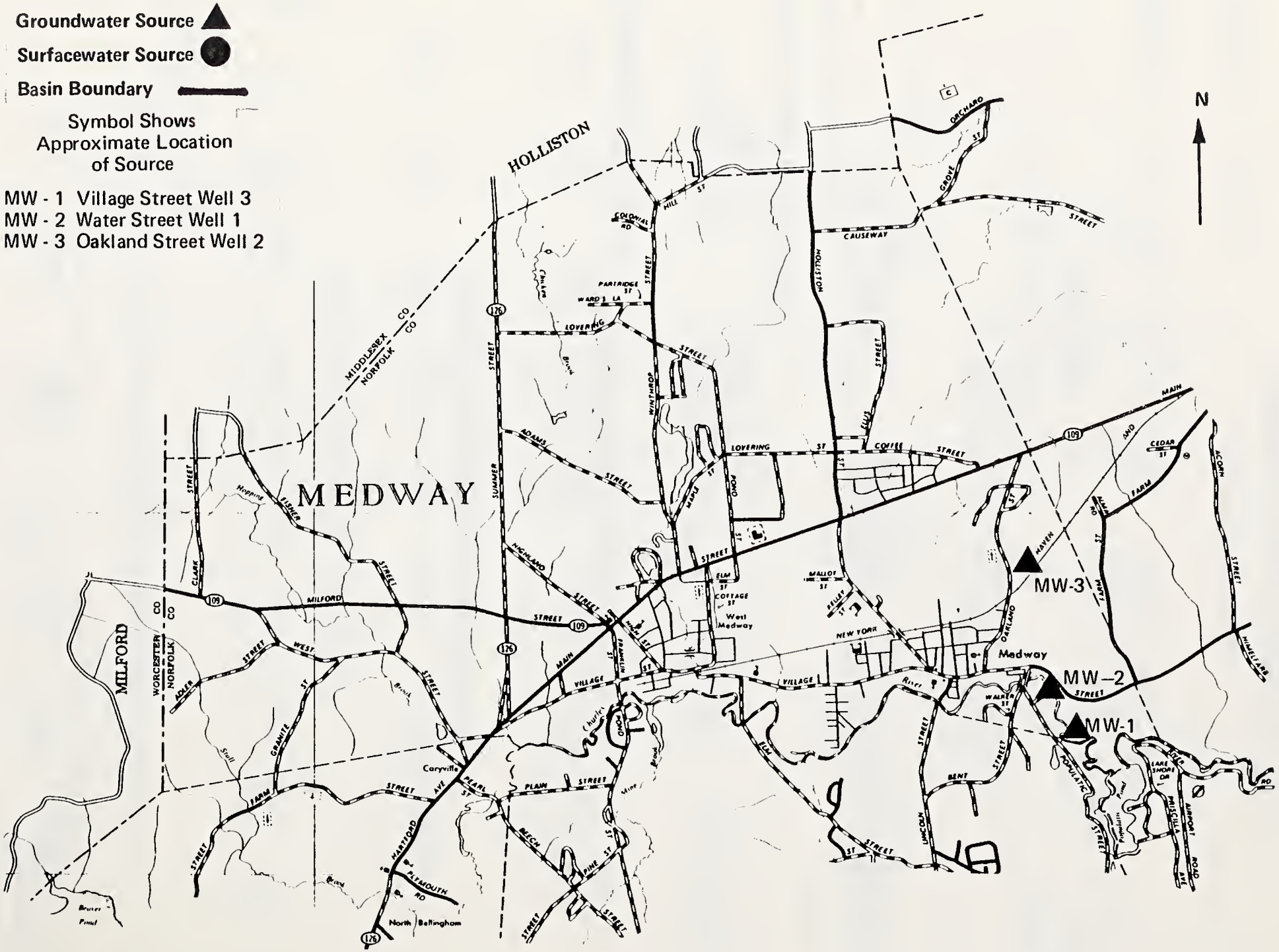
Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows Approximate Location of Source

MW - 1 Village Street Well 3
MW - 2 Water Street Well 1
MW - 3 Oakland Street Well 2



DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Medway **WATER SUPPLY AGENCY:** Medway Water Deparment

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
7,938	8,447	9,037	10,000	10,400	10,500	10,600

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
9,037	11.67	774

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
8,676	96%	361	4%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.72	0.68	0.63	0.81	0.72	0.73	0.72

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.56	1.37	1.56	1.59	1.35	1.35	1.46

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.73	95.1	88.8	92.9	93.8	114.0	115.1	107.5	109.9	106.4	94.4	92.2	91.6%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
0.80	0.91	1.01

Maximum Day Demand (mgd)

1990	2000	2020
1.62	1.84	2.05

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
1.46 (mgd)	2.05 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Medway

WATER SUPPLY AGENCY: Medway Water Department

River Basin Acreage Distribution:

Charles
7,468 (100%)

Total Acreage:

7,468 acres (11.67 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Village St. Well # 3	Charles	0.58	0.51	MW-1	Used all year
Water Street Well # 1	Charles	0.72	0.14	MW-2	Not used in March and April
Oakland Sreet Well # 2	Charles	0.65	0.07	MW-3	Used Feb-Sept
Milford Water Company	Charles		0.01		Purchase water from Milford water Company

TOTAL: 1985 ADD 0.73

TOTAL: 1985 ADD on River Basin Charles 0.73

Wastewater Discharge:

48 percent of the population of the Town of Medway utilizes the Charles River Pollution Control District's (CRPCD) wastewater treatment facility to dispose of their wastewater. The treatment plant's effluent is discharged into the Charles River.

The remaining 52 percent of the towns population discharges their wastewater via individual on-site septic disposal fields.

LEGEND

Groundwater Source

Surfacewater Source

Filtration Plant

Basin Boundary

Symbol Shows
Approximate Location
of Source

ML - 1 Echo Lake
ML - 2 Charles River
ML - 3 Clarks Island Wells
ML - 4 Godfrey Brook Wells
ML - 5 Dilla Street Wells

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Milford

WATER SUPPLY AGENCY: Milford Water Company

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
19,352	23,390	24,038	26,000	26,600	26,800	27,000

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
24,038	15.00	1,603

Public Water Supply Service Population: Milford Water Company

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
23,557	98%	481	2%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
2.54	2.59	2.75	2.97	2.95	3.11	2.82 (all customers)
2.40	2.47	2.61	2.80	2.79	2.93	2.67 (Milford only)

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
3.80	3.94	4.01	4.32	4.24	3.89	4.03 (all customers)
3.59	3.76	3.81	4.07	4.01	3.66	3.81 (Milford only)

Monthly Percentage of Average Day Demand
(Milford only)

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2.93	100.7	101.9	88.2	103.1	108.1	88.1	114.4	112.8	84.7	103.9	103.2	88.9%

Projected Water Demand: Milford only

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
2.89	3.17	3.52	4.12	4.52	5.02

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
2.67 (mgd)	3.52 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Milford **WATER SUPPLY AGENCY:** Milford Water Company

River Basin Acreage Distribution:

Charles	Blackstone
8,278 (86%)	1,325 (14%)

Total Acreage:

9,603 acres (15.00 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Echo Lake	Charles	2.50	1.23	ML 1	Not used in March & April
Charles River	Charles	2.50	0.70	ML 2	Not used July- Oct. Dependent upon weather
Clarks Island Wells	Charles	1.01	0.59	ML 3	Not used in Jan. Used dependent upon Echo Lake levels
Godfrey Brook Wells	Charles	0.50	0.51	ML 4	Used all year
Dilla Street	Charles	0.50	0.08	ML 5	Used Feb, May & July - Nov. Will be used in parallel with Clarks Island Wells

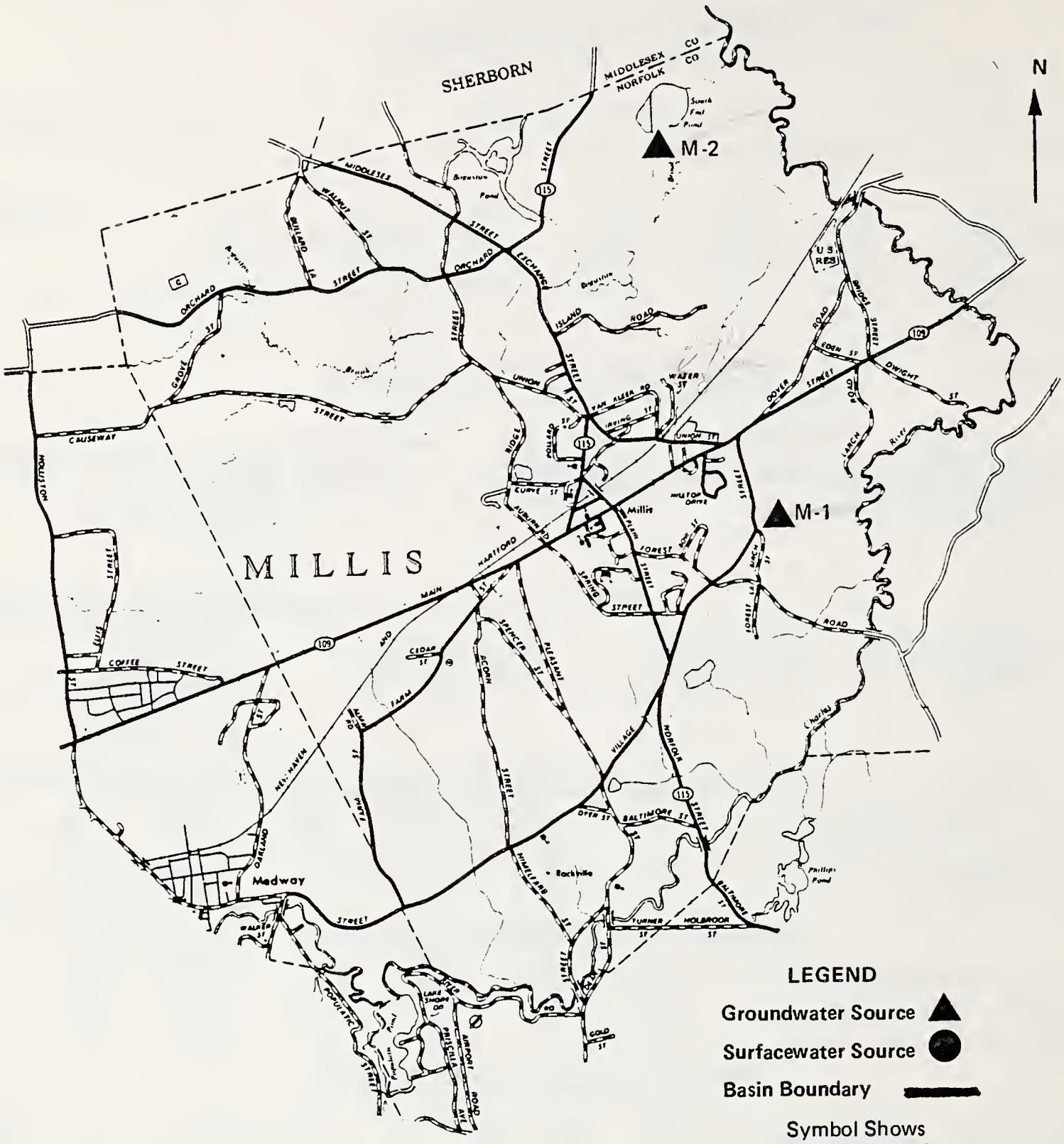
TOTAL: 1985 ADD 3.11

TOTAL: 1985 ADD on River Basin Charles 3.11

Wastewater Discharge:

85 percent of the population of the Town of Milford utilizes the Milford Wastewater Treatment Plant to dispose of their wastewater. The treatment plant's effluent is discharged into the Charles River.

The remaining 15 percent of the town's population discharges their wastewater via individual on-site septic disposal fields.


SHERBORN
MIDDLESEX CO / NORFOLK CO
N
M-2
M-1
MILLIS
Millis
Medway
Rockville
LEGEND
Groundwater Source
Surfacewater Source
Basin Boundary
Symbol Shows Approximate Location of Source
M - 1 Birch Street Well 3
M - 2 South End Pond Well 4

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Millis

WATER SUPPLY AGENCY: Millis Department of Public Works

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
5,686	6,908	6,689	8,200	8,600	8,700	8,800

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
6,689	12.25	546

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
6,355	95%	334	5%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.69	0.63	0.66	0.69	0.59	0.55	0.64

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.52	1.26	1.66	1.71	0.84	0.77	1.29

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.55	87.5	91.4	89.3	92.6	109.9	116.9	113.2	122.1	99.2	94.1	93.4	93.7%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
0.78	0.91	1.02	1.58	1.83	2.05

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
1.29 (mgd)	2.05 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Millis

WATER SUPPLY AGENCY: Millis Department of Public Works

River Basin Acreage Distribution:

Charles
7,841 (100%)

Total Acreage:

7,841 acres (12.25 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Birch Street Well # 3	Charles	0.66	0.54	M-1	Used all year
South End Pond Well # 4	Charles	0.86	-0-	M-2	On line Dec 31, 1985
Medway Water Department	Charles	N/A	0.01		Purchased from Medway

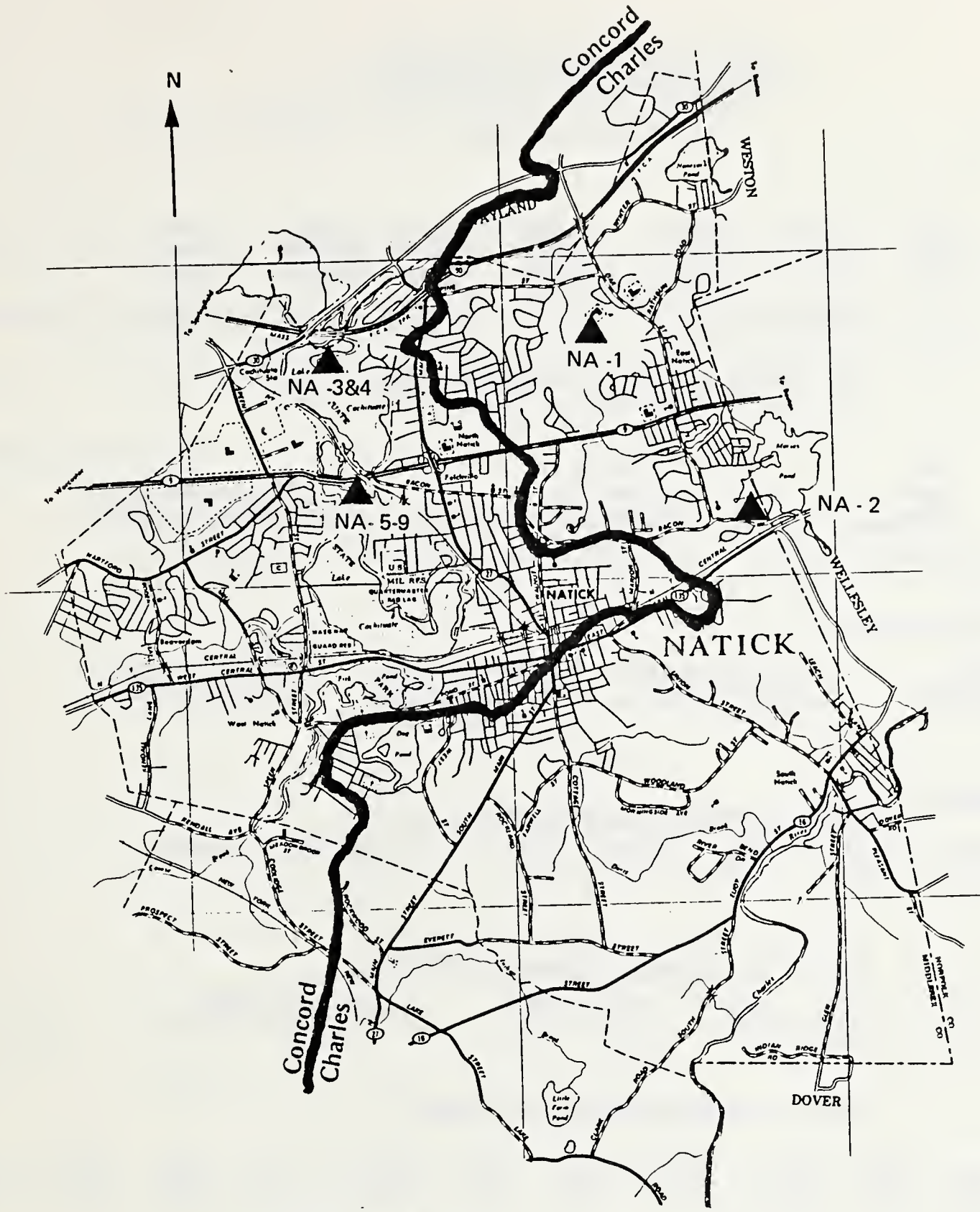
TOTAL: 1985 ADD 0.55

TOTAL: 1985 ADD on River Basin Charles 0.55

Wastewater Discharge:

36 percent of the population of the Town of Millis utilizes the Charles River Pollution Control District's (CRPCD) wastewater treatment facility to dispose of their wastewater. The treatment plant's effluent is discharged into the Charles River.

The remaining 64 percent of the town's population discharges their wastewater via individual on-site septic disposal fields.



LEGEND

Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ▬

Symbol Shows
Approximate Location
of Source

NA - 1 Pine Oak Wellfield
NA - 2 Morse Pond Wellfield (back-up)
NA - 3 Evergreen Well 2
NA - 4 Evergreen Well 1
NA - 5 Springvale Well 3
NA - 6 Springvale Well 4
NA - 7 Springvale Well 1
NA - 8 Springvale Well 2
NA - 9 Springvale Well 5

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Natick **WATER SUPPLY AGENCY:** Natick Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (2)
31,057	29,461	30,280	31,900	32,500	33,000	33,000

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Town of Natick (MAPC agrees)

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
30,280	15.98	1,895

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
30,280	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
4.45	4.22	3.81	3.99	4.33	4.39	4.20

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
7.35	6.59	7.05	11.52	8.31	6.94	7.96

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
4.39	87.0	90.9	91.4	93.5	106.5	109.1	115.9	114.1	104.5	96.3	92.9	98.8

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
4.43	4.74	5.28	8.40	8.99	10.00

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
7.96 (mgd)	10.00 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Natick **WATER SUPPLY AGENCY:** Natick Water Department

River Basin Acreage Distribution:

Charles 5,442 (53%)
Concord (Concord & Sudbury) 4,785 (47%)

Total Acreage:

10,227 acres (15.98 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Pine Oak Wellfield	Charles	2.02	0.21	NA-1	Used July -Dec
Evergreen Well # 2	Concord	2.53	1.54	NA-3	Used all year
Evergreen Well # 1	Concord	1.73	1.18	NA-4	Used all year
Springvale Well # 3	Concord	1.37	1.14	NA-5	Used all year
Springvale Well # 4	Concord	1.41	0.17	NA-6	Not used in March & Oct-Dec
Springvale Wells #1 & #2	Concord	1.15	0.09	NA-7 NA-8	Not used Jan-March
Springvale Well # 5	Concord	0.29	0.06	NA-9	Used Jan-July
Morse Pond Wellfield	Charles	0.29	-0-	NA-2	Back up, Low pH. Requires construction of a treatment plant

TOTAL: 1985 ADD 4.39

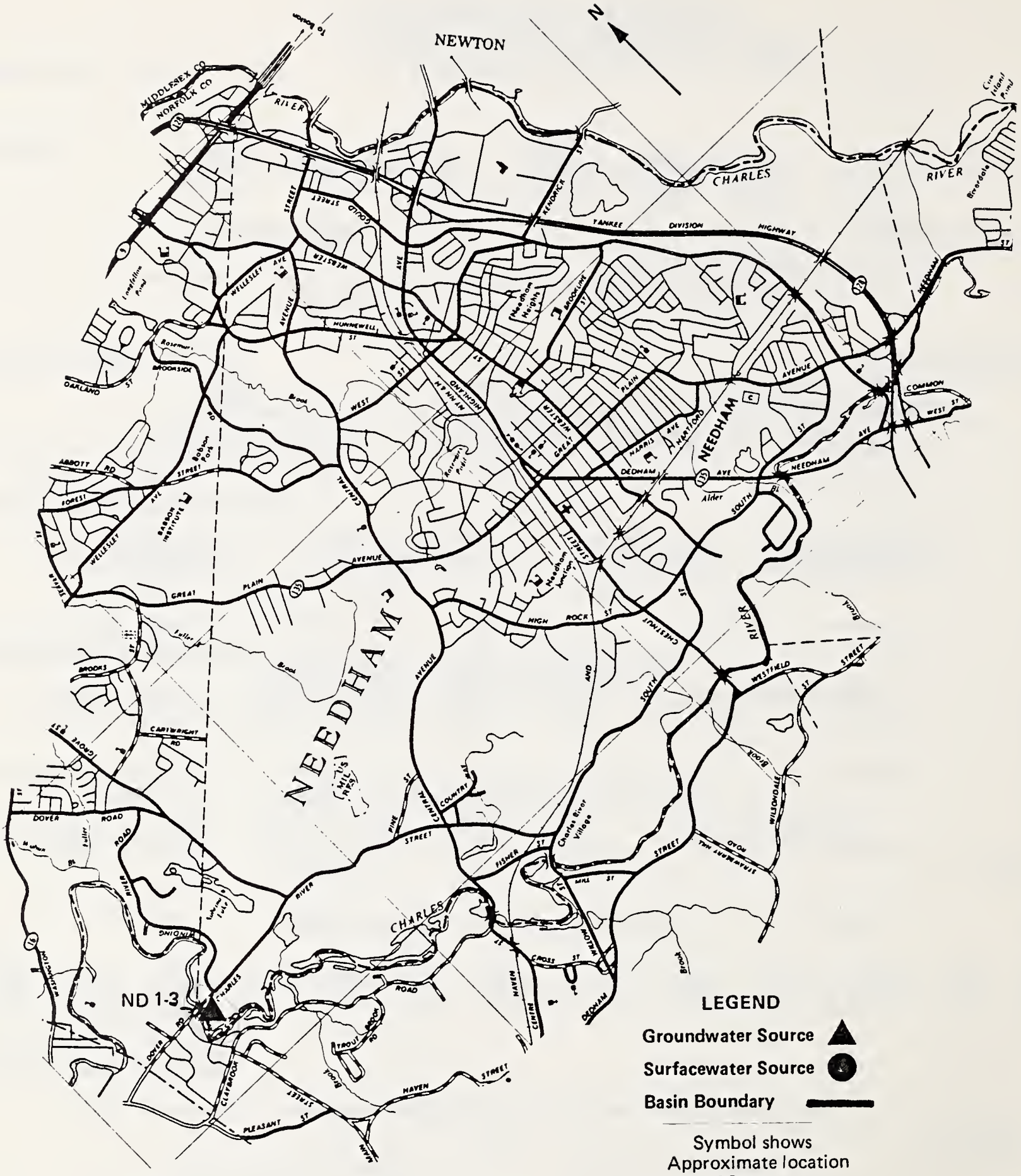
TOTAL: 1985 ADD on River Basin

Charles	0.21
Concord	4.18

Wastewater Discharge:

75 percent of the population of the Town of Natick utilizes the MWRA wastewater treatment facility at Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin, (Basin #28).

The remaining 25 percent of the town's population discharges their wastewater via individual on-site septic disposal fields.


NEWTON
N
MIDDLESEX CO
NORFOLK CO
CHARLES RIVER
YANKEE DIVISION HIGHWAY
NEEDHAM
NEEDHAM HEIGHTS
NEEDHAM JUNCTION
CHARLES RIVER
ND 1-3
LEGEND
Groundwater Source
Surfacewater Source
Basin Boundary
Symbol shows
Approximate location
of Sources
ND - 1 Charles River St. Well 3
ND - 2 Charles River St. Well 2
ND - 3 Charles River St. Well 5

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Needham

WATER SUPPLY AGENCY: Needham Department of Public Works
Water Division

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
29,748	27,901	27,870	29,000	29,000	29,000	29,000

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
27,870	12.73	2,189

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
27,870	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
3.63	3.63	3.45	3.73	3.53	3.59	3.59

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
8.20	7.83	8.92	9.52	7.03	6.38	7.98

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
3.59	84.9	83.4	86.8	96.1	108.0	109.8	132.8	121.9	102.7	94.6	88.9	88.4%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
3.74	3.92	4.30	8.30	8.72	9.55

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
7.98 (mgd)	9.55 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Needham **WATER SUPPLY AGENCY:** Needham DPW, Water Division

River Basin Acreage Distribution:

Charles
8,150 (100%)

Total Acreage:

8,150 acres (12.73 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Charles River Street Well #3	Charles	1.72	1.65	ND-1	Used all year
Charles River Street Well #2	Charles	2.16	1.43	ND-2	Used all year
Charles River Street Well #5	Charles	1.00	-0-	ND-3	Emergency
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		0.51		Used all Year

TOTAL: 1985 ADD 3.59

TOTAL: 1985 ADD on River Basin

Charles	3.08
Chicopee/Nashua	0.51

Wastewater Discharge:

90 percent of the water sold in the Town of Needham goes to customers using the MWRA wastewater treatment facility at Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin #28).

The remaining 10 percent discharges wastewater via individual on-site septic disposal fields.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Newton **WATER SUPPLY AGENCY:** Newton Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
91,263	83,622	82,925	81,900	80,700	80,400	80,200

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
82,925	18.17	4,564

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
82,925	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
11.11	11.61	11.15	11.60	10.49	10.10	11.01

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
21.00	24.99	23.50	23.54	19.77	17.37	21.70

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
10.10	106.7	91.7	81.6	109.6	90.4	99.2	137.5	105.2	122.3	86.7	86.3	82.8%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
10.87	11.30	12.27	21.43	22.26	24.17

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
11.01 (mgd)	12.27 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Newton **WATER SUPPLY AGENCY:** Newton Water Department

River Basin Acreage Distribution:

Charles
11,632 (100%)

Total Acreage:

11,632 acres (18.17 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		10.10		

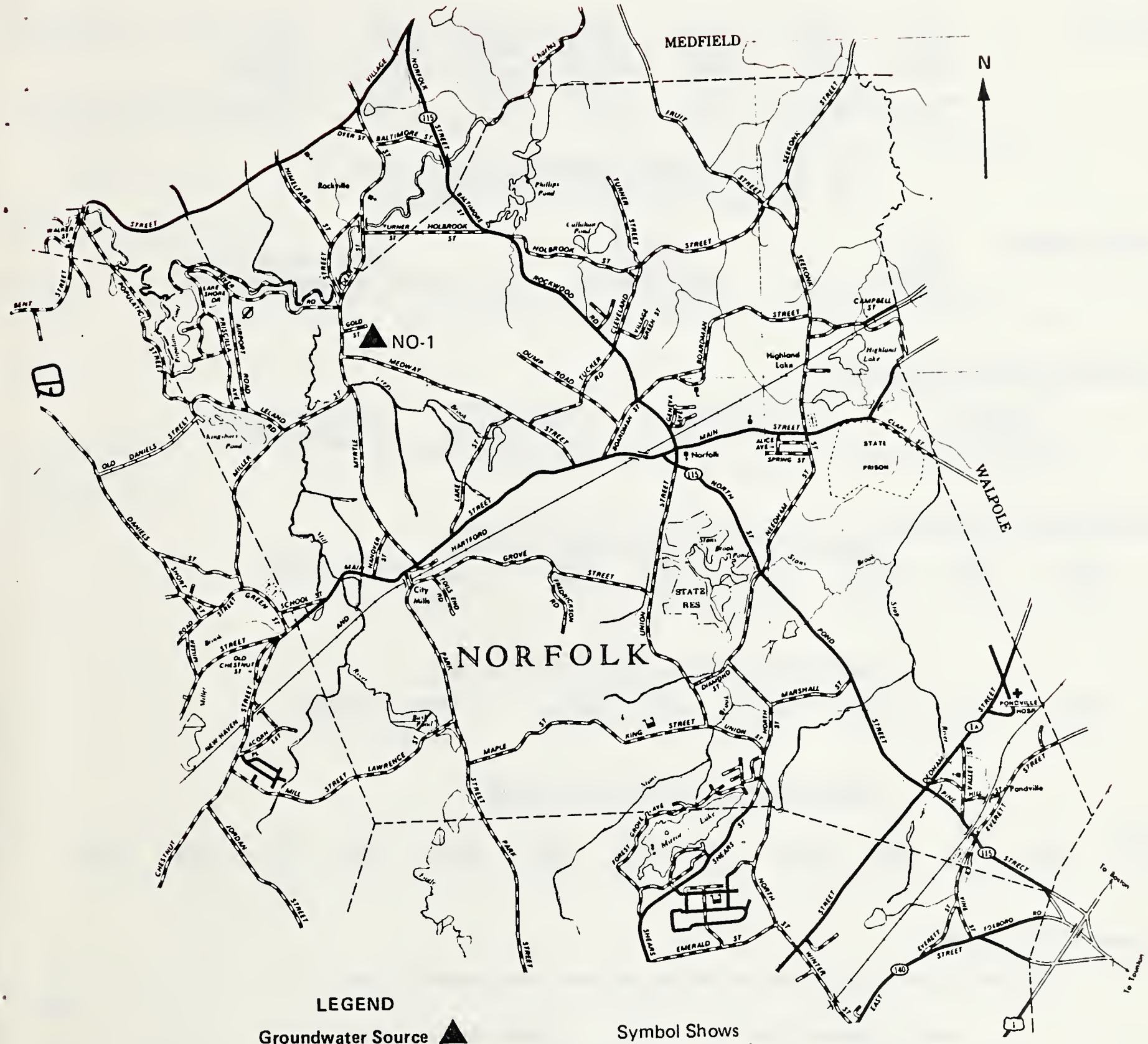
TOTAL: 1985 ADD 10.10

TOTAL: 1985 ADD on River Basin

Chicopee/ Nashua 10.10

Wastewater Discharge:

100 percent of the population of the City of Newton utilizes the MWRA wastewater treatment facilities at Deer Island and Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin #28). The average daily discharge in 1985 was approximately 10.10 mgd.


MEDFIELD
N
NO-1
NORFOLK
WALPOLE
Rockville
Norfolk
Highland Lake
Highland Lake
City Mills
STATE RES
STATE PRISON
Phillips Pond
Stony Brook Pond
Stony Brook
Stony Brook
Stony Brook
Mirror Lake
Pondville
To Boston
To Foxboro
LEGEND
Groundwater Source
Surfacewater Source
Basin Boundary
Symbol Shows Approximate Location of Source
NO - 1 Gold Street Well

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Norfolk **WATER SUPPLY AGENCY:** Norfolk Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
4,656	6,363	8,210	9,330	10,690	11,860	13,030

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
8,210	15.32	536

Public Water Supply Service Population:

Population on Public Supply (Norfolk Water Dept)	Percent of Population on Public Supply	Population with On-Site Wells & other water systems	Percent of Population with On-Site Wells
3,366	41%	4,844	59%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.22	0.23	0.18	0.18	0.22	0.24	0.22

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.34	0.43	0.27	0.26	0.24	0.24	0.30

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.24	119.6	86.9	75.5	91.3	101.2	107.6	124.9	107.5	89.9	100.8	91.1	82.1%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
0.30	0.44	0.84	0.42	0.60	1.15

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
0.30 (mgd)	1.15 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Norfolk WATER SUPPLY AGENCY: Norfolk Water Department

River Basin Acreage Distribution:

Charles	Taunton
9,780 (99.8%)	20 (0.20%)

Total Acreage:

9,805 acres (15,32sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Gold St. Well	Charles	0.50	0.17	NO-1	
Wrentham Water Department & Wrentham State School	Charles		0.07		

TOTAL:	1985 ADD	0.24
TOTAL:	1985 ADD on River Basin Charles	0.24

Wastewater Discharge:

100 percent of Norfolk's population discharges their wastewater via individual on-site septic disposal fields.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Sherborn

WATER SUPPLY AGENCY: None, Entire town served by on-site wells

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
3,309	4,049	4,350	5,000	5,300	5,300	5,300

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
4,350	16.14	270

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
-0-	-0-	4,350	100

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
Non Applicable						

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
Non Applicable						

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Non Applicable - No central water supply system												

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
Non Applicable			Non Applicable		

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (DD)	2020 Demand for Planning Purposes (2020 projected DD)
(mgd)	(mgd)
Non Applicable	Non Applicable

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Sherborn **WATER SUPPLY AGENCY:** No Public Supply

River Basin Acreage Distribution:

Charles	Concord (Concord and Sudbury)
8,440 (82%)	1,887 (18%)

Total Acreage:

10,327 acres (16.14sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Non-Applicable					

TOTAL: 1985 ADD Non -Applicable

TOTAL: 1985 ADD on River Basin Non-Applicable

Wastewater Discharge:

100 percent of Sherborn's population discharges their wastewater via individual on-site septic disposal fields.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Waltham

WATER SUPPLY AGENCY: Waltham Department of Public Works, Water Division

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
61,582	58,200	57,955	58,200	58,200	58,200	58,200

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
57,955	13.66	4,243

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
57,955	100	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
11.50	10.92	10.82	9.91	9.81	10.47	10.57

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
13.30	18.24	17.22	15.66	15.96	15.19	15.93

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
8.92	92.5	92.8	95.8	93.2	94.4	105.5	105.5	106.6	105.7	104.3	102.0	101.0

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
10.61	11.15	12.21	16.05	16.85	18.40

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
10.57 (mgd)	12.21 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Waltham

WATER SUPPLY AGENCY: Waltham DPW, Water Division

River Basin Acreage Distribution:

Charles
8,740 (100%)

Total Acreage:

8,740 acres (13.66 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		10.47		

TOTAL:	1985 ADD	10.47
TOTAL:	1985 ADD on River Basin Chicopee/ Nashua	10.47

Wastewater Discharge:

100 percent of the population of the City of Waltham utilizes the MWRA wastewater treatment facility at Deer Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin #28). The average daily discharge in 1985 was approximately 10.47 mgd.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Watertown

WATER SUPPLY AGENCY: Watertown Department of Public Works

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
39,307	34,384	32,189	32,400	32,000	31,900	31,800

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
32,189	4.14	7,775

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
32,189	100%	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
4.70	4.31	4.12	3.86	3.53	3.43	3.99

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
7.05	6.63	6.47	6.62	5.99	6.13	6.48

Monthly Percentage of Average Day Demand

1986 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
3.54	100%	84%	94%	94%	104%	102%	110%	107%	105%	97%	104%	99%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
4.02	4.16	4.53

Maximum Day Demand (mgd)

1990	2000	2020
6.52	6.76	7.36

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
3.99 (mgd)	4.53 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Watertown **WATER SUPPLY AGENCY:** Watertown Department of Public Works

River Basin Acreage Distribution:

Charles	Boston Harbor (Mystic)
2,579 (97%)	72 (3%)

Total Acreage:

2,651 acres (4.14 sq. miles)

Sources of Public Water Supply:

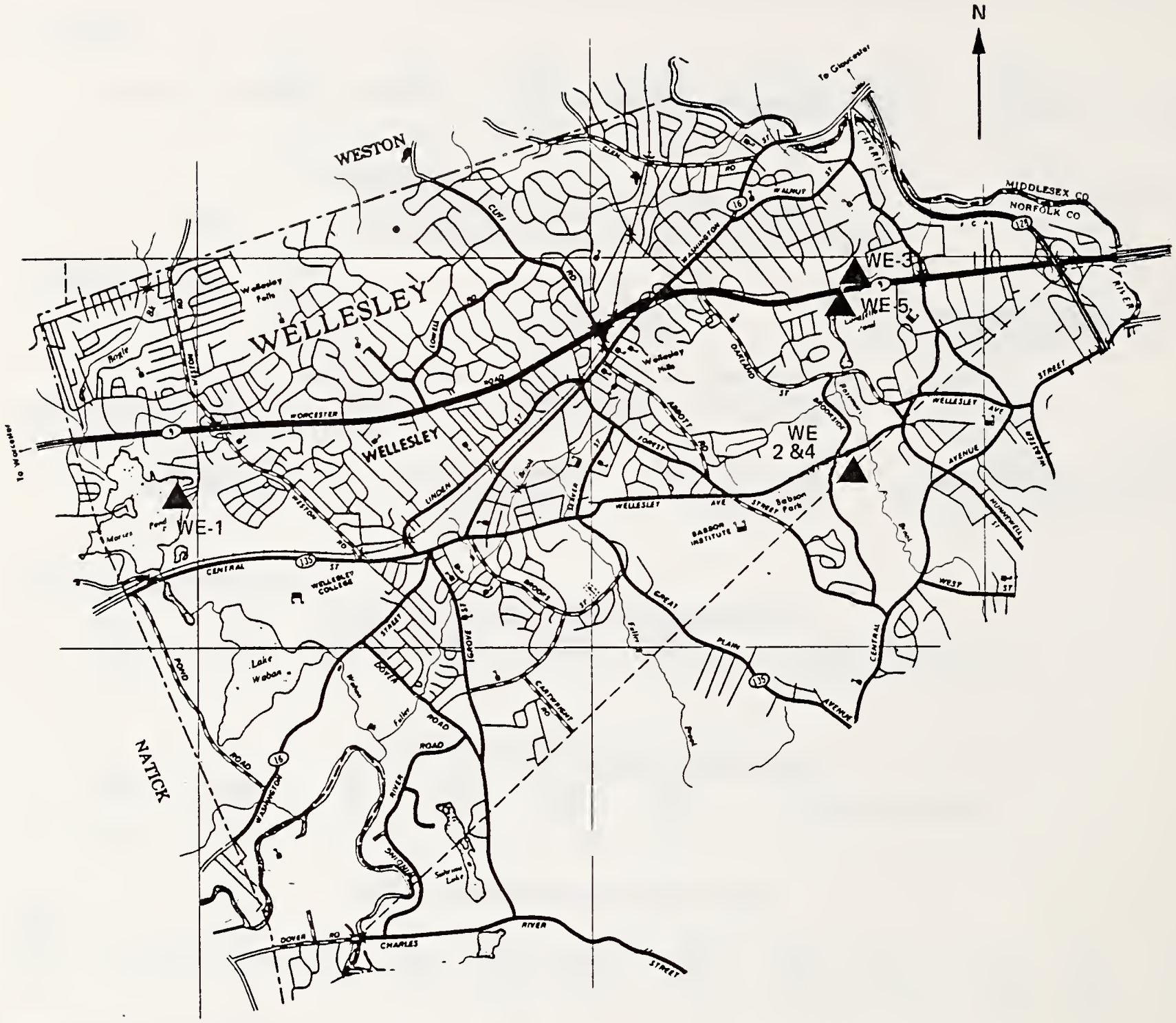
Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority (MWRA)	Chicopee/ Nashua		3.43		

TOTAL: 1985 ADD 3.43

TOTAL: 1985 ADD on River Basin Chicopee/Nashua 3.43

Wastewater Discharge:

100 Percent of the population of the Town of Watertown utilizes the MWRA wastewater treatment facility at Deer Island. The treatment plant's effluentis discharged into Boston Harbor in the Massachusetts Coastal Basin, (Basin #28). The average daily discharge in 1985 was approximately 3.43 mgd.



LEGEND

Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows
Approximate Location
of Sources

WE	- 1	Morse's Pond Wells 1 and 2
WE	- 2	Wellesley Ave. Wells 1 and 2
WE	- 3	Rosemary Well
WE	- 4	T.F. Coughlin Well
WE	- 5	Longfellow Pond Well

Not shown: partial supply from MWRA

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Wellesley

WATER SUPPLY AGENCY: Wellesley Department of Public Works, Water and Sewer

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
25,051	27,209	27,052	27,200	27,200	27,200	27,200

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
27,052	10.50	2,576

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
25,158	93%	- 0 -	- 0 -

(2,000 population from Wellesley College or 7% supplied by wells at Wellesley College)

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
3.05	2.90	2.52	2.66	2.52	2.53	2.70

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
5.37	5.13	4.83	5.22	4.19	4.70	4.91

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
2.53	86.5	87.9	83.9	94.0	103.9	104.3	130.3	124.2	103.8	93.7	97.8	90.6%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
2.71	2.85	3.12	4.94	5.18	5.68

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
4.91 (mgd)	5.68 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

ITY: Wellesley WATER SUPPLY AGENCY: Wellesley DPW, Water and Sewer

sin Acreage Distribution:

Charles
6,772 (100%)

Total Acreage:

6,772 acres (10,50 sq. miles)

ırces of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Morses Pond Wells #1 & 2	Charles	2.02	0.94	WE-1	Used all year
Wellesley Ave. Wells #1 &2	Charles	1.30	0.75	WE-2	Used all year
Rosemary Well	Charles	0.60	0.34	WE-3	Used all year
T.F. Coughlin Well	Charles	0.86	0.32	WE-4	Used all year
Longfellow Pond Well	Charles	0.40	0.21	WE-5	Used all year
MWRA Contract	Chicopee/ Nashua	7.50	-	-	Not Used

TOTAL: 1985 ADD 2.53

TOTAL: 1985 ADD on River Basin
Charles 2.53

Wastewater Discharge:

100 Percent of the population of the Town of Wellesley utilizes the MWRA wastewater treatment facility at Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin, (Basin #28). The average daily discharge in 1985 was approximately 2.53 mgd.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Weston

WATER SUPPLY AGENCY: Weston Water Department

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
10,870	11,169	10,743	10,800	10,800	10,800	10,800

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
10,743	17.32	620

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
10,743	100	-0-	-0-

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.15	1.20	1.07	0.91	1.20	1.16	1.12

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
3.04	2.71	2.71	2.65	2.92	2.77	2.80

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.16	59.6	74.0	75.7	92.5	121.8	128.6	156.7	140.9	101.6	82.5	80.9	79.2%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)

1990	2000	2020
1.13	1.18	1.29

Maximum Day Demand (mgd)

1990	2000	2020
2.81	2.96	3.24

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (ADD)	2020 Demand for Planning Purposes (2020 projected ADD)
1.12 (mgd)	1.29 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Weston **WATER SUPPLY AGENCY:** Weston Water Department

River Basin Acreage Distribution:

Charles	Concord (Concord & Sudbury)
10,091 (91%)	992 (9%)

Total Acreage:

11,083acres (17.32 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Massachusetts Water Resources Authority(MWRA)	Chicopee/ Nashua	-	1.16	-	

TOTAL: 1985 ADD 1.16

TOTAL: 1985 ADD on River Basin

Chicopee/ Nashua	1.16

Wastewater Discharge:

100 percent of Weston's population discharges their wastewater via individual on-site septic disposal fields.

DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Westwood **WATER SUPPLY AGENCY:** Dedham-Westwood Water District

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
12,750	13,212	13,174	13,200	13,200	13,200	13,200

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
13,174	11.09	1,188

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
12,911	98%	263	2%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.23	1.23	1.19	1.24	1.25	1.24	1.23

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.85	1.86	1.89	1.96	1.89	1.69	1.86

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
1.24	97.5	92.7	93.1	99.6	106.9	107.8	107.8	102.0	97.6	97.2	94.0	100.5%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
1.23	1.29	1.41	1.86	1.95	2.13

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
1.86 (mgd)	2.13 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Westwood

WATER SUPPLY AGENCY: Dedham-Westwood Water District

River Basin Acreage Distribution:

Charles	Neponset
2,311 (33%)	4,786 (67%)

Total Acreage:

7,097 acres (11.09 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Dedham/Westwood combined Pumping Capacity of Source (mgd)	Westwood only 1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Bridge Street Wellfield	Charles	2.00	0.19	DW-1	Used all year
Rock Meadow Well # 11	Charles	0.80	0.72	DW-2	Used by Westwood Only
White Lodge Well # 2	Neponset	1.20	0.21	DW-3	Used all year
White Lodge Well # 1	Neponset	1.20	0.12	DW-4	Used all year except during Sept.
White Lodge Well #3	Neponset	N/A	0.00	DW-5	Off line in 1985. Rehabilitated in 1987 with Treatment Plant
White Lodge Well # 4	Neponset	N/A	0.00	DW-6	Off line in 1985. Rehabilitated in 1987 with Treatment Plant

TOTAL: 1985 ADD 1.24

TOTAL: 1985 ADD on River Basin

Charles	0.61
Neponset	0.63

Wastewater Discharge:

100 percent of the population of the Town of Westwood utilizes the MWRA wastewater treatment facility at Nut Island. The treatment plant's effluent is discharged into Boston Harbor in the Massachusetts Coastal Basin (Basin # 28). The average daily discharge in 1985 was approximately 1.24 mgd.

LEGEND

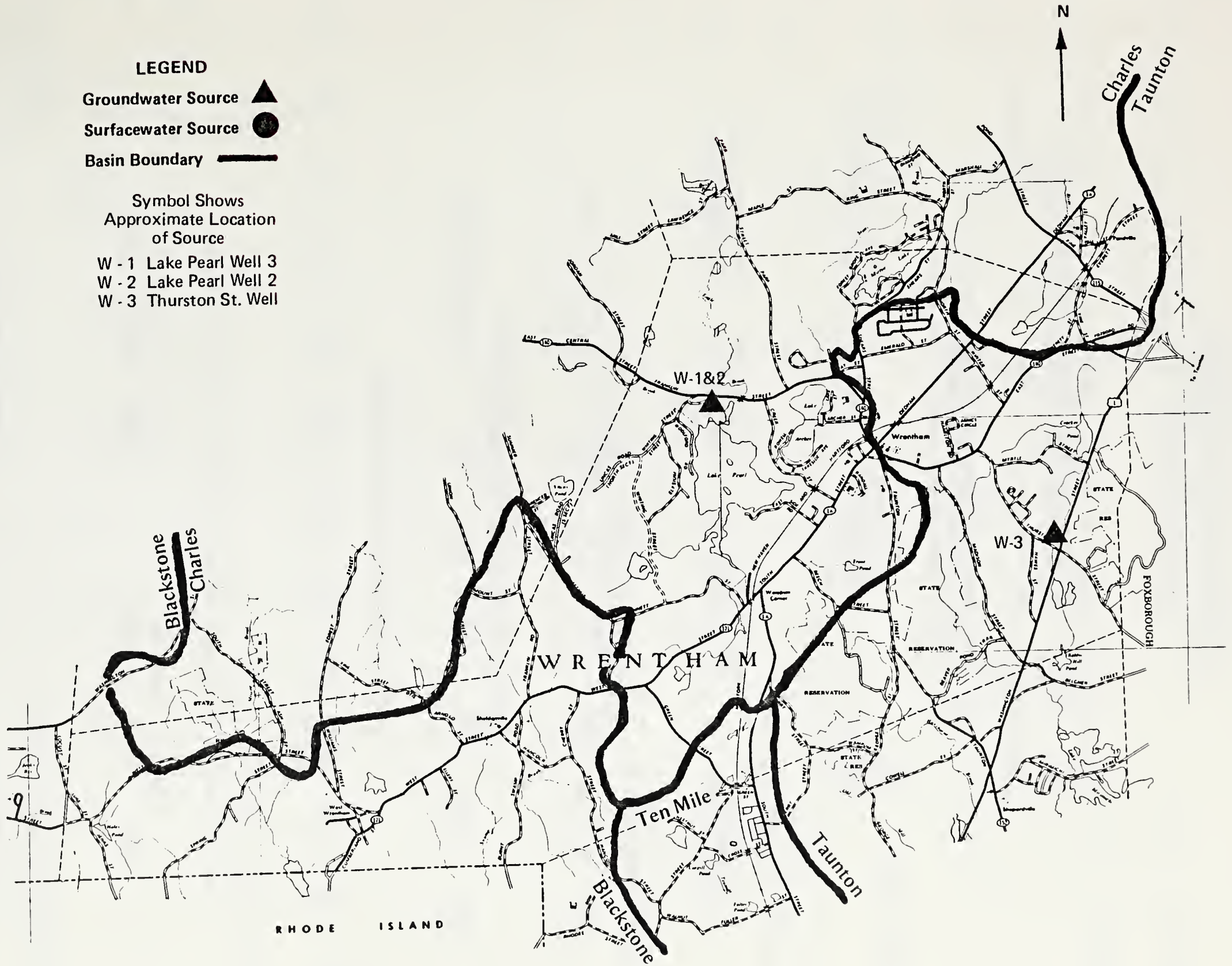
Groundwater Source ▲

Surfacewater Source ●

Basin Boundary ——

Symbol Shows
Approximate Location
of Source

W - 1 Lake Pearl Well 3
W - 2 Lake Pearl Well 2
W - 3 Thurston St. Well



DIVISION OF WATER RESOURCES
WATER SUPPLY FACTS - SUMMARY

COMMUNITY: Wrentham

WATER SUPPLY AGENCY: Wrentham Department of Public Works, Water Division

Population:

1970 U.S. Census	1980 U.S. Census	1985 State Census (1)	1990 Projected Population (2)	2000 Projected Population (2)	2010 Projected Population (2)	2020 Projected Population (3)
7,315	7,580	7,223	9,500	9,900	10,000	10,100

(1) 1985 State Census by Massachusetts Secretary of State
(2) Prepared by the Metropolitan Area Planning Council
(3) Straightline continuation of MAPC 2010 Projections

Population Density:

1985 State Census	Area of Community (in square miles)	1985 Population Density (persons per square miles)
7,223	22.56	320

Public Water Supply Service Population:

Population on Public Supply	Percent of Population on Public Supply	Population with On-Site Wells	Percent of Population with On-Site Wells
5,778	80%	1,445	20%

Current Public Water Supply Use:

Average Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
0.82	0.80	0.75	0.86	0.87	0.93	0.84

Maximum Day Demand (millions of gallons per day)

1980	1981	1982	1983	1984	1985	6 year average (mgd)
1.81	1.81	2.21	1.59	1.48	2.07	1.82

Monthly Percentage of Average Day Demand

1985 ADD	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
0.93	88.1	84.5	85.2	93.9	106.7	112.7	122.6	111.2	103.5	95.2	96.9	96.1%

Projected Water Demand:

Using DWR's standard water demand methodology, the future water demand is as follows:

Average Day Demand (mgd)			Maximum Day Demand (mgd)		
1990	2000	2020	1990	2000	2020
1.10	1.28	1.50	2.39	2.78	3.26

Projected Water Need in the Year 2020

1980 to 1985 Six Year Average (MDD)	2020 Demand for Planning Purposes (2020 projected MDD)
1.82 (mgd)	3.26 (mgd)

DIVISION OF WATER RESOURCES

PUBLIC WATER SUPPLY SOURCES - SUMMARY

COMMUNITY: Wrentham **WATER SUPPLY AGENCY:** Wrentham Department of Public Works, Water Division

River Basin Acreage Distribution:

Charles	Blackstone	Taunton	Ten Mile
6,273 (43%)	3,728 (26%)	4,071 (28%)	366 (3%)

Total Acreage: 14,438 acres (22.56 sq. miles)

Sources of Public Water Supply:

Name of Source	Basin Location of Source	Pumping Capacity of Source (mgd)	1985 ADD of Source (mgd)	DWR Map Symbol of Source	Notes
Lake Pearl* Well # 3	Charles	0.72	0.35	W-1	Used all year
Lake Pearl* Well # 2	Charles	0.72	0.21	W-2	Not used in March and April
Thurston St. Well	Taunton	0.86	0.37	W-3	Used all year

* also known as Franklin Street Wells

TOTAL: 1985 ADD 0.93

TOTAL: 1985 ADD on River Basin

Charles	0.56
Taunton	0.37

Wastewater Discharge:

Wrentham State School has a treatment plant located on the Stop River, a tributary of the Charles River.

Other than the school, 100 percent of Wrentham's population discharges their wastewater via individual on-site septic disposal fields.